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Plant Breeding Abstracts.

Vol. III, No. 1.

Part I. British Empire

PLANT PATHOLOGY 632

1. NEWTON, M. and JOHNSON, T. 632.452:575.12:576.16
Studies in cereal diseases. VIII. Specialization and hybridization of wheat stem rust, *Puccinia graminis tritici* in Canada.
Bull. Dept. Agric. Can. 1932 : 160 : 60 pp.

This paper includes a survey of the work at present accomplished on the physiologic forms of *Puccinia graminis tritici* as well as a detailed account of the methods and technique employed for identifying the various forms and their hybridization.

Work on the distribution of the physiologic forms in Canada has been in progress since 1919. Up to 1930, 41 forms have been isolated and the results of the annual surveys shew that there are marked variations in the prevalence of the different forms from year to year. Forms predominating one year may disappear in the next. It has been found that only a small number of forms is responsible for most of the frequently severe damage due to wheat stem rust in Canada. Fifty per cent of the forms isolated were forms 36 and 21, while these together with 38, 17 and 49 made up 75 per cent of the isolation.

Investigation on the factors influencing the distribution of wheat stem rust in Canada shew that the spores were carried northward by south winds.

Among other factors at work are the varieties of wheat grown, the differences in the length of the uredinium-producing periods of the different physiologic forms, and the possibilities for hybridization on the barberry.

The identification of the various forms is complicated by the fact that their reactions are found to vary considerably under different conditions of temperature and probably also of light, though to a lesser extent. Controlled conditions are therefore a necessity in identifying physiologic forms.

Mutations, both in colour and pathogenicity, have been found to occur in *P. graminis tritici*. The results of selfing experiments shew that with regard to pathogenicity most of the forms do not behave like pure lines but are in a heterozygous condition.

Crosses between physiologic forms shew Mendelian types of segregation both with regard to colour and pathogenicity. There is also some evidence for cytoplasmic inheritance.

Crosses have been made between *Puccinia graminis tritici*, *P. graminis secalis* and *P. graminis agrostidis* and the few hybrids so far obtained of both crosses shew a strikingly low virulence compared with the parent forms.

Physiologic forms are not to be regarded as pure lines and segregation into various forms takes place when the teliospores germinate.

Physiologic forms may be of great practical value in the determination of the purity of varieties of wheat and in investigations on the inheritance of seedling rust resistance.

The discovery of the independent inheritance of mature plant resistance is discussed. Plants possessing it may be resistant to all the physiologic forms although in the seedling stage they may have been susceptible to one or more forms.

ECONOMIC PLANTS 633/5

2. NEETHLING, J. H. 633.11(68)
Wheat varieties in South Africa. Their history and development until 1912.
Sci. Bull. Pretoria, 1932 : 108 : 41 pp.

Based on references in the old literature an account is given of the varieties, of which there have been many, introduced and produced in the country up to 1912. Certain varieties persistently remained even after 1900 and the author deprecates the fact that these, which were doubtless of great merit from certain points of view, should have been finally allowed to disappear.

3. PERCIVAL, J. 633.11:575.127:576.356.46
Cytological studies of some wheat and *Aegilops* hybrids.
 Ann. Bot. Oxford 1932 : 46 : 479-501.

This is a continuation of the work reviewed in "Plant Breeding Abstracts" Vol. I, Abst. No. 7. The heterotype divisions of the pollen mother cells of hybrids from the following 11 crosses were examined:—

T. monococcum var. *flavescens* x *T. aegilopoides* var. *Thaoudar*, *T. dicoccum* var. *Timopheevi* x *T. aegilopoides*, *Aegilops ovata* x *Ae. triaristata*, *Ae. uniaristata* x *Ae. Heldreichii* and *Ae. umbellulata*, *Ae. caudata* x *Ae. triaristata*, *T. durum* var. *hordeiforme* and *T. vulgare* var. *lutescens*, *Ae. triaristata* (tetraploid and hexaploid) x *T. vulgare* var. *millurum* and *Ae. triaristata* (hexaploid) x *T. durum* var. *leucurum*.

The term synizesis is used for the contracted condition at any stage of the heterotype division, acrosynesis is substituted for telosynesis and the longitudinally split univalent is termed a monad, the single chromosome being a dyad and the bivalent a tetrad structure.

In support of the assumption that parasynthetic pairing of the chromosomes is indicative of exact homology the 7 bivalents of the hybrid *T. monococcum* x *T. aegilopoides* were, in almost every case, of the parasynthetic type, as also the 7 bivalents of the hybrid *T. dicoccum* x *T. aegilopoides*. In the hybrid *Ae. caudata* x *T. durum* the 2-5 bivalents were all acrosynthetic, some of the other hybrids shewed both the acrosynthetic and parasynthetic types and in some the majority were unpaired according to the degree of relationship between the parents.

An examination of the leptotene threads points to their being monads, two uniting to form a univalent.

4. RAW, A. R. 633.11:575.42:581.48:664.641.016
Endosperm characters in wheat. Investigations with Free Gallipoli, 1928-1931. Parts I and II.
 J. Dept. Agric. Vict. 1932 : 30 : 247-54, 288-300.

Part I. A general account of the composition of the endosperm with special reference to "quality."

Part II. The endosperm of grains of Free Gallipoli (a selection from Gallipoli which originated from Clubhead x Yandilla King) was found to be of three types, flinty and translucent, mealy, opaque and yellow in colour and an intermediate mottled type, part translucent and part opaque.

The translucent and opaque grains were grown separately. In the first year 43 per cent of the plants from the translucent seed and 59 per cent of the plants from the opaque seed produced only translucent grains, the rest of the plants produced mottled grains, no opaque grain was produced. Similar results were obtained in the two following years. The conclusion is drawn that these types of endosperm are not inheritable but are largely the result of external conditions of which climate is probably the most important.

Under laboratory conditions the germination percentage of translucent and opaque grains was the same but in the field the translucent grains were superior, probably due to their greater resistance to attack by fungi. The rate of germination however was greater in the opaque grains and these grains had a slightly lower vitality than the translucent type.

The translucent grains were found to contain more nitrogen than the opaque but subsequent tests of total nitrogen from plants selected for translucent grain were not significant.

There was a correlation between the translucency of the grain and 1,000 grain weight. Selection is also being made for size and shape of grain.

5. MACINDOE, S. L. 633.11-2.452-1.521.6:575
Resistance to stem rust. Recent developments in breeding resistant wheats.
 Agric. Gaz. N.S.W. 1932 : 43 : 420-22.

A very brief review of accepted methods of breeding for resistance and certain recent discoveries in the U.S.A. and Canada.

In New South Wales large numbers of hybrids are under examination and certain resistant hybrids with desirable agronomic qualities have now been obtained. The "mature plant resistance" of the Canadians is being used in the new crosses.

6. **ROBB, W.** 633.13 Elder :575
 633.13 Bell :575
Oat breeding. Notes on two new varieties of oats recently registered by the Department of Agriculture for Scotland.
 Scott. J. Agric. 1932 : 15 : 273-79.

The Scottish Plant Breeding Station was formed at Corstorphine in 1921 and one result has been the production of two new varieties of oats ; Elder, from a cross between Castleton Potato and Beseler's Prolific, is characterized by good tillering and yield and especially by its resistance to lodging. It ripens about as early as Victory and is recommended for the fertile and earlier districts of Scotland.

Bell, from the cross Sandy x Leader is earlier than either parent, tillers well, has a moderate yield, does not shed its grain easily and is not so liable to lodge as Sandy ; it is recommended for late districts with poor soils.

7. **PHILP, J.** 633.13:575.242:575.116.1
Fatuoid or false wild oats.
 Nature 1932 : 129 : p. 796.

Referring to the note summarized in " Plant Breeding Abstracts " Vol. II, Abst. No. 532 the author points out that in an allotriploid such as the hybrid in question the genetic behaviour is almost impossible to interpret. It is also pointed out that crossing-over in the chromosomes carrying the fatuoid complex is observed. This does not prove that crossing-over occurs within the fatuoid complex itself, therefore the Winge-Huskins hypothesis is not invalidated.

8. **BELL, G. D. H.** 633.16(42)
The history and origin of the cultivated forms of barley and the classification of the two-row barleys of the British Isles.
 J. Inst. Brew. Lond. 1932 : 38 : 371-75.

After a very brief reference to the views on the origin of cultivated barleys a scheme is outlined whereby the sorts at present under cultivation can be recognized and classified.

9. **MAHALANOBIS, P. C.** 633.18:519.24
A statistical note on certain rice-breeding experiments in the Central Provinces.
 Ind. J. Agric. Sci. 1932 : 2 : 157-69.

The author takes the data of Mahta and Dave in the previous volume of this journal and shews how they are amenable to treatment by means of Fisher's " analysis of variance " technique. Full arithmetical details of the working out of the method are given, and the author establishes the superiority of the technique over that used in the first instance by Mahta and Dave.

10. **HAIGH, J. C.** 633.18:575.42(54.8)
A short review of the paddy work done by the Economic Botanist.
 Trop. Agriculturist 1932 : 78 : 384-85.

The work has taken the form of isolation of pure lines and testing them. Those selections giving more than 15 per cent over the local paddy were retained and the tests are continued from year to year. Attempts are being made to produce a white rice equal in yielding ability to the popular red strains now in cultivation.

11. **PRASADA, R.** 633.51C.402
C. 402 a new variety of long staple cotton in the United Provinces of Agra and Oudh.
 Bull. Dept. Agric. U. Prov. 1931 : 58 : 20 pp.

The origin of the variety was from the cross *G. arboreum* x *G. neglectum roseum* made to increase the length of lint. The ginning percentage however of the progeny was unsatisfactory and it was crossed with *G. cernuum* Tod. After 20 years' work on the progeny, a plant was isolated which matured no later than the normal late varieties, shewed a high yield, an average ginning percentage of 35 per cent on the unpurified material and a satisfactory spinning value. Grown under good conditions the cotton equals that of Punjab American.

12. SYMOND, J. E. and WILLIAMS, T. L. 633.51:575(66.7)
Cotton development, 1930-1931—Tamale investigational station.
Yearb. Dept. Agric. Gold Coast 1930 : Bull. No. 23 : 166-74.

In the section on selection and breeding the results of plant to row selections, using self-pollinated plants, are briefly described. One strain was outstanding "combining good yield and lint length with fair ginning percentage."

13. PEAT, J. E. 633.51:575(68.9)
The Cotton Breeding Station, Gatooma, Southern Rhodesia.
Emp. Cott. Grow. Rev. 1932 : 9 : 199-206.

The station and its policy and progress up to date are outlined briefly.

Certain selections were made from U.4 for greater jassid resistance and this served as a satisfactory selection stock. A strain which will do well not only in normal, but in wet and dry years and under conditions of boll worm attack is essential. Some very satisfactory lots are now under observation.

Particular attention is being centred on resistance to bollworm and also on the quality of the lint, whilst stainer attack may influence the breeding of the future.

14. MCINTOSH, A. E. S. 633.61:575.12(72.98)
An investigation into the evolution of sugar cane varieties by breeding in Barbados, 1887-1925, with a discussion on the application of the findings to the present day scheme of work.
Agric. J. Barbados 1932 : 1 : 1-17.

From 1887-1925 the method of obtaining seedlings was by open pollination as well as by controlled pollination from 1902-1919. During this period, however, no good variety was produced by this method.

Records are given of the parent varieties used and the number of seedlings from them which reached the "select variety" stage, and the parentage of "promising seedlings."

These data show that the present day canes have all been derived from 5 "lines," two originating from White Transparent, the others of unknown parentage.

Seedlings are now mainly obtained by means of controlled hybridization and crosses are being made with foreign varieties and especially with indigenous varieties to encourage variability. Better results are expected from crosses between varieties of different "lines" than between varieties of the same "lines."

15. 633.61:575.12(94.3)
Sugar cane breeding in Queensland.
Aust. Sug. J. 1931 : 23 : 417-21.

Contains an account of the sugar cane breeding work in progress at the South Johnstone Experiment Station.

The modified Hawaiian method of pollination is used for crossing and the Jesweit hair group system for identification of the varieties.

P.O.J. 2878 is being tested at the station, so far with satisfactory results. P.O.J. 2714 has proved too susceptible to a number of diseases to be recommended.

A large number of seedlings are grown for selection each year.

16. 633.63:575
Progress in beet breeding.
Brit. Sug. Beet Rev. 1932 : 5 : 227-29.

A short and general account, mainly of the work of the Great Western Sugar Company's breeding work at Edgar, Montana, with particular emphasis on the value of home-grown seed.

17. POUND, F. J. 633.74:575.42

The principles of cocoa selection.

Proc. Agric. Soc. Trin. Tob. 1932: 32: 122-27.

This paper records the results of one year's work on the yield in cocoa under the Cocoa Research Scheme.

To improve yield and quality, trees are required which yield a large number of large, round beans. Trinidad possesses a large number of different cocoas said to be the result of crosses between Criollo and types resembling Calabacillo.

A survey of Plantation Cocoa in the island shewed that there were trees with a wet bean content of 150-180 or even 200 g. per pod, an average weight on drying of $7\frac{1}{2}$ pods to the pound, a marked advance on the present 10-12 pods per pound. Assuming 40 beans per pod the average dry weight per bean will be 3.75 g. which is definitely above the average for samples now graded as superior cocoa.

Trees combining these qualities have been found and if after several years observation their performance is satisfactory they will be vegetatively propagated and distributed.

18. MURRAY, R. K. S. 633.912

Proved *Hevea* clones.

Quart. Circ. Rubb. Res. Scheme Ceylon 1932: 9: 1-13, and Trop. Agriculturist

1932: 79: 25-37.

A brief account of each of the most common clones grown in Ceylon.

19. THOMAS, P. H. 634.11:575(94.6)

Apple varieties raised in Tasmania. (4) The Crofton.

Tasmanian J. Agric. 1932: 3: 131-33.

The Crofton, the result of hybridization of Fameuse (syn. Pomme de Neige), is one of the best late-keeping varieties and is largely exported. A pomological description is given.

20. FISHLOCK, W. C. 634.61:575.42(66.7)

Results at the coconut plantation, Atwabo.

Yearb. Dept. Agric. Gold Coast 1930: Bull. No. 23: 144-50.

The palms giving the best yield of copra and the highest number of nuts are being selected for distribution.

21. STRONG, W. J. 635.63:581.163

Parthenocarpy in the cucumber.

Sci. Agric. 1932: 12: 665-69.

All varieties and hybrids tested set a number of fruits without pollination but the proportion of parthenocarpic fruits formed to the number of pistillate blossoms varied very considerably in different varieties. This suggests that high or low degree of parthenocarpy is essentially a varietal characteristic although easily influenced by environment.

Part II. Foreign

GENETICS 575

22. SABNIS, T. S. 575.061.633

Inheritance of variegation. II.

Z. indukt. Abstamm.- u. VererbLehre. 1932 : 62 : 213-31.

From a study of many different variegated plants three kinds of plastids, albinotic, yellow and green, have been established. Differences were also observed in the size and shape of the cells of the palisade and spongy tissue and of the plastids, as well as in the number and colour of the latter.

The author's view is that "variations originated from the variegated tissue of the meristem" and that further investigation is necessary.

23. HAAN, H. DE 575.113

The symbolizing of hereditary factors.

Genetica 1932 : 15 : 1-21.

The symbols applied to hereditary factors by geneticists have frequently no relation to each other and the same factor may be given a completely different symbol by different workers. It is obvious that as the number of known hereditary factors multiplies such confusion will increase and it is time some uniform scheme is proposed and its use agreed upon. To this end the methods in use in the past are briefly reviewed and the recent attempts to procure uniformity are described.

The author then describes a new scheme, using Latin letters, which it is hoped may be discussed by a representative international committee as soon as possible.

24. GOLDSCHMIDT, R. 575.17:575.113.3

Bemerkungen zur Kritik der quantitativen Natur multipler Allele. (Observations on criticisms of the quantitative nature of multiple allelomorphs.)

Bull. Lab. Genet. Leningrad 1932 : 9 : 129-34.

It is pointed out that although several growth processes may be affected by one gene, yet each is also dependent on the whole developmental process of the plant, which latter is independent of the gene in question. Moreover, when the growth curve of an organ, for example, is irregular each subsequent addition of some influence such as that produced by a gene, will not have a quantitatively equal result. Therefore the fact that multiple allelomorphs do not produce a parallel effect of a number of different characters which they influence does not disprove or prove their quantitative nature.

The author also points out that in the present position of knowledge of the structure of the gene and the action upon it of X-rays it is not possible to argue that the production of reverse mutations is incompatible with the quantitative nature of the gene.

25. HONING, J. A. 575.182

Plasmatische Einflüsse auf Spaltungsverhältnisse. (The influence of the plasma on segregation ratios.)

Z. indukt. Abstamm.- u. VererbLehre. 1932 : 62 : 93-95.

Although the observed segregation ratios of the seedlings with and without a red border to the leaves were beyond criticism in the back-cross of the F_1 (of *Canna indica* x *C. aureo-vittata*) x *aureo-vittata* ♂, the comparison of the ratios of the older plants of this cross with the reciprocal shewed considerable differences.

It is assumed that the *indica* plasm, without disturbing the reduction division, offers a better chance to the development of the combination of dominant *indica* factors than the *aureo-vittata* plasm.

The differences in light requirement of *Nicotiana* seeds is not to be found in the testa, as various F_1 tests with *N. macrophylla* as the female parent varied from 2-35 or even 91 per cent according as the male parent has a greater or less light requirement. If this were the result of the diploid endosperm the difference should disappear in F_2 , but it still occurs though to a less marked degree. It is suggested that the effect is caused by the influence of the plasma of the female parent over which the nucleus only gradually gains complete control.

26. SCHMIDT, M. 575.182
Die genetische Bedeutung des Plasmas bei Pflanzen, besonders bei reziprok
verschiedenen Artbastarden. (**The genetical significance of the plasma
in plants, especially in various reciprocal species hybrids.**)
Züchter 1932: 4: 191-98.

There are two contrasting points of view with regard to this much discussed question of cytoplasmic inheritance, one holds that the plasma is only as a substratum on which the genes act, the other regards the plasma as containing definite elements or "plasmons" which are inherited. Jones in 1912 was the first to demonstrate exactly differences in reciprocal hybrids and to attribute them to the effect of the maternal plasma. Similar differences have been shewn among *Epilobium* hybrids by several workers and the phenomena are explained as the effect of the maternal plasma on the gene concerned.

The effect of the plasma has also been found by Wettstein in mosses and by Harder in the *Basidiomycetes*. Honing has shewn that the differences in the degree of light requirement of the seeds in reciprocal crosses of tobacco is not due to the diploid endosperm, as it still shews in F_2 , but is an effect of the plasma.

Other cases are briefly noted.

The inheritance of variegation is another, still unexplained, aspect of cytoplasmic inheritance. It is clear that the effect of the plasma must be considered in breeding work.

27. TSCHERMAK, E. 575.183-181
Bemerkungen über echte und falsche Grössen-Xenien. (**Notes on true and
false size xenia.**)
Z. Züchtung 1932: A.17: 447-50.

True xenia appears either in the first seed generation SG_1 , if the character is dominant and segregates on Mendelian lines in SG_2 , or, if recessive, it appears first in SG_2 and segregates in SG_3 . This concept holds for the qualitative characters of colour and shape and must still more be insisted on for the quantitative characters such as size and weight.

Various conditions may cause changes in the size of the seed. Such changes can only be attributed to true xenia if the character is inherited independently in future generations. The increase in size and weight of seeds as the result of crossing and attributed to xenia by Nicolaisen (see "Plant Breeding Abstracts" Vol. II, Abst. No. 427) requires verification. In the author's opinion it is probably an effect of heterosis.

True size xenia has only been observed by the author and Tavčar (cf. also Goodspeed in *Nicotiana*) in crosses between large and small seeded races of *Phaseolus*.

In numerous crosses between other *Leguminosae* (also in flax, Tammes) there was true xenia with regard to colour and shape but not for size. The same is true for the author's crosses between cereals. In *Triticum villosum* and *Secale montanum*, (also *Aegilops ovata*, Schiemann) differences in size and colour of the grain have been observed according to the position in the ear and the flowering sequence which by a superficial examination might be mistaken for xenia although the colour occurs not in the aleurone layer but in the testa.

28. STEIN, E. 575.243
Zur Entstehung und Vererbung der durch Radiumbestrahlung erzeugten
Phytophysinome. (**On the origin and inheritance of the phytophysinomas
produced by radium radiation.**)
Z. indukt. Abstamm.- u. Vererb. Lehre. 1932: 62: 1-14.

Those diseased plants which shewed no obvious abnormality of the cells and also F_1 plants from a cross between a normal plant and one with the so-called "excess tissue" shew in the normally developing tissue much enlarged cells and nuclei and strikingly swollen nucleoli.

From a plant R.1350 which had been irradiated as an embryo, there were produced three branches differing from each other and from the original which all shewed the enlargement of the cells in one or other of the outer layers of the growing point. There was also a proliferation of the cells in other parts, sometimes causing sterility.

The progeny of a treated plant, R.1053, all shewed different colour and form defects and the "excess tissue." The inheritance of these defects was constant when the plants were selfed. These were crossed with normal plants. Except for some defective sterile plants the progeny were either normal or shewed minute splashes of colour in their flowers. F_1 plants without this defect, when selfed, segregated into normal and defective plants like the original parent in ratios approaching 3 : 1 and on the whole the result of back-crossing supported this conclusion. The segregation in F_2 was normal.

The results of selfing the plants with the splashed colour of the flowers was too complex for analysis.

29. BRINK, R. A. and COOPER, D. C. 576.312.36:633.15
Chromosome rings in maize and *Oenothera*.
 Proc. Nat. Acad. Sci. Wash. 1932 : 18 : 447-55.

It has been shewn that the 4 and 6 chromosomes comprising the rings known in maize separate at random to the poles and crossing-over takes place as freely as in the normal chromosomes. Segmental interchange alone therefore does not account for the stability of the corresponding complexes in *Oenothera*. The authors suggest that in the latter the interchange has come about in such a way that the segments have become inverted and so pairing is prevented in the reversed portions.

30. BRUUN, H. G. 576.356.5
 Studien an heterostylen Pflanzen. I. Versuch einer Verknüpfung von Chromosomenzahl und Heterostylie. (Studies on heterostylytic plants. I. An attempt at a connection between chromosome number and heterostyly.)
 Svensk Bot. Tidskr. 1932 : 26 : 163-74.

Primula longiflora is tetraploid and monomorphic and the diploid members of the group are heterostylytic in contrast to other polyploid and monomorphic species. This is a further confirmation of the summation theory of Winge.

It is suggested that occurrence of monomorphic forms in an originally heterostylytic group has been brought about by hybridization followed by a doubling of the chromosome number.

31. GUSTAFSSON, Å. 576.356.5:575.113
 Spontane Chromosomenzahlerhöhung in Pollenmutterzellen und die damit verbundene Geminibildung. (Spontaneous increase in chromosome number in pollen mother cells and the gemini formation connected with it.)
 Hereditas 1932 : 17 : 100-14.

In the pollen mother cells of a form of *Taraxacum vulgare* ($2n = 24$), chromosome numbers were observed ranging from 24-76. There was also an increase in size of the cells in proportion. The increase in chromosome number is probably due to a fusion of the cells and a longitudinal splitting of chromosomes in the pre-meiotic stages. In spite of the obvious homology between the chromosomes only very few bivalents were observed (never more than 8) and this is attributed to the action of an inhibiting gene.

It is also suggested that the degeneration of the female reproductive organs in *Taraxacum* and *Archieracium* is due to the loss of a gene for the regulation of normal meiosis.

32. WINGE, Ö. 576.356.5:575.129
On the origin of constant species-hybrids.
 Svensk Bot. Tidskr. 1932 : 26 : 107-22.

The data occurring in the literature concerning 24 amphidiploids of various species are examined and in 8 of them the doubling of the chromosome number is found to have occurred in the somatic tissue of the F_1 , a method previously suggested by the author ; in 5 cases the increase is by the union of diploid gametes of F_1 and in the rest the mode of origin is still obscure.

33. SAPEHIN, A. A. 578.082
Die züchterische Bedeutung der Verkürzung der Vegetationsperiode nach
T.D. Lyssenko. (The importance to the breeder of the shortening of
the vegetative period by the methods of T. D. Lyssenko.)
Züchter, 1932: 4: 147-51.

The following is an account of the most important methods used by T. D. Lyssenko.

The plant is regarded as passing, during its development, through a series of stages each characterized by its own morpho-physiology. Different complexes of external conditions are necessary for each stage and the different biotypes require correspondingly different conditions. In the first development stages of wheat for instance, for some varieties the temperature should not be less than -2° and not over 10° , for others the range is 3° — 15° or 5° — 20° . The length of time during which these temperatures are necessary also varies among varieties.

Cotton seeds, germinated in October at a temperature of 25 — 30° and then transferred to a temperature of 10 — 25° , produce mature plants by April. Seeds left in the cool greenhouse during the whole period remain in the vegetative condition.

Lyssenko has shewn that not only light but also darkness may be a necessary condition to the development of *Panicum sativum*.

His work also shews that the time necessary for the transition from the vegetative to the reproductive stage is independent of the size and age of the plant. The germinating seed represents the mature plant; the various stages in development being called forth only by external conditions.

The phenomenon is known by the Russian word "Jarowisazia" and has a far-reaching practical importance.

In so far as the genotype allows, growth can be very considerably speeded up and in breeding work several generations can be quickly grown. The method is also of value for selection work.

BOTANY 581

34. BUCHHOLZ, J. T. and BLAKESLEE, A. F. 581.331.23
Pollen-tube growth in primary and secondary $2n + 1$ *Daturas*.
Amer. J. Bot. 1932: 19: 604-26.

A study of the rate of growth of pollen-tubes of $2n + 1$ plants, both primaries and secondaries in normal styles shewed that only five or possibly six of the extra chromosomes of the twelve primaries are transmissible through the pollen and two or possibly three of the secondaries.

35. *WULFF, E. V. 581.9
(Introduction to the historical geography of plants.)
Suppl. 52 Bull. Appl. Bot. Genet. and Plant-Breed. 1932: 356 pp.

A full treatment in its broadest aspect of a science which, applied to cultivated plants, forms one of the most important of the many contributions of the U.S.S.R. to modern plant breeding. The subject matter is treated historically and very full bibliographies are appended to each chapter. The general character of plant distribution is outlined and various factors influencing this are discussed.

For a very large number of systematic units it is possible to determine the centre at which the greatest number of specimens is found and the centre at which the greatest variety of forms occurs. The latter is of great importance in deciding the place at which the unit in question has originated. Two types of endemics are distinguished, the ancient relic remaining isolated as a result of some special conditions and the newly evolved form which has not yet attained a wide range. The peculiar disjunction in the areas of so many species is emphasized and one by one various factors are discussed and shewn to be incapable of having brought about this disjunction by artificial transport of the species.

The great part which has been played by climatic changes in the past in determining present areas is emphasized.

* A full summary of this paper is on file at the Bureau.

The cultivated plants have in the past not been studied from this point of view but the recent investigations of the Russian school have proved to be of extreme interest and the methods and results are described in some detail. The majority of cultivated plants have turned out to be collective species consisting of 2 or more subspecies, each with its own area and centre of distribution. The most astounding wealth of genic material, especially dominant characters, is found at these centres, gradually diminishing on passing towards the periphery of the area, just as in the case of wild species. In these centres the plant is most like the wild species from which it is supposed to have originated and it is only on passing away from the centre that the plant becomes specifically adapted to definite growth conditions, these adaptive characters being frequently recessive. Secondary centres of development, characterized by the presence of a large proportion of recessive characters and endemics, are often found in the peripheral zones. Almost every characteristic of the areas of wild species is shared by the areas of cultivated plants. The areas of the nearest wild species and genera are in all cases quite distinct from those of the cultivated species and often the two do not even overlap.

These principles are illustrated by rather detailed descriptions of the areas of lentil, wheat, oats, bean, cotton, potato, the melons, watermelons and cucurbits.

In explanation of these facts the author supposes that the cultivated plants have arisen by the introduction into cultivation by primitive peoples of wild species existing in nature. In some cases the original wild species has died out, but in others—e.g. the melons and potatoes, etc.—the process can actually be seen still in progress, either in the use of plants growing in the wild state or growing as weeds amongst another crop. This process has occurred at repeated times and in different places in the case of most crops and thus their origin is polyphyletic.

It is shown that the peculiarities of the present distribution of plants can only be satisfactorily explained by Wegener's theory of the origin of the continents by separation from one continuous earth mass, taking place gradually and accompanied by changes in the position of the pole which caused extreme climatic changes at the present poles and in Europe.

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36. WENTZ, J. B. 633:575

An outline of a course in crop breeding.

J. Amer. Soc. Agron. 1932: 24: 481-93.

An outline is given of a comprehensive survey of plant-breeding ranging from its early history to its present status, and including sections on hybridization, hybrid vigour, mutation, etc.

References to literature suitable for the average and advanced student are provided as well as various problems and exercises.

37. SNOEP, W. 633:575:576.341

Over de beteekenis van het zuigkrachtonderzoek van zaden in verband met de selectie. (The importance of osmotic pressure investigations of the seed in relation to selection.)

Bergcultures 1932: 6: 667-69.

When a seed germinates in a given solution this indicates that the solution in question is osmotically less concentrated than the seed. Various reasons are presented why a high osmotic pressure is desirable.

Osmotic pressure has been found to be a racial character and plants from seed selected for high osmotic pressure give higher yields than unselected material. Sorts originating in dry climates are characterized by relatively high osmotic pressures and these are generally more drought-resistant; similarly with cold resistance, earliness; pedigree lines as a whole have a higher pressure than the local races and high-quality tobaccos higher than poor ones.

The osmotic pressure seems to be inherited through the maternal parent.

The author suggests that it is worth while to investigate the osmotic question in perennial tropical crops with a view to applying it also to the selection of these; preliminary experiments have already been started in *Hevea*, tobacco and coffee.

38. MÜLLER, K. O. 633-2-1.521.6
 Ueber die Erzeugung Krankheitsresistenter Pflanzenrassen. (**The production of disease resistant races of plants.**)
 Pflanzenbau, Pflanzenschutz u. Pflanzenzucht 1932 : 8 : 265-71.

A brief survey of the problems and results of breeding for disease resistance.

Although differences among plants in disease resistance have long been recognized it was not till after the discovery of Mendel's laws that the work was placed on a scientific basis. In plants, resistance is inherent and may be active or passive in which case the plant may become infected by the entry of the parasite through a wound.

There may be all degrees of resistance from total immunity to total susceptibility and resistance may be much influenced by external conditions.

The supply of material suitable for crossing may be a difficulty. The cultivated plants may all be to some extent susceptible and it then becomes necessary to find the original habitat of the species where the variety of forms is greatest and where the desired material is probably to be found.

The resistance must then be tested under conditions which provide the maximum opportunity for the development of the disease.

Resistance follows the rule of Mendelian segregation and may be dependent on the presence of one or several factors.

The work is complicated by the presence of biologic races of many of the disease organisms and further by the linkage of the factors for resistance with undesirable characters.

When a wild form is crossed with a cultivated form in order to add to it disease resistance and to discard as soon as possible the other wild characters the F_1 is backcrossed to the cultivated parent so increasing the chances of obtaining the desired form.

The results of scientific plant breeding shew themselves among others in the increased disease resistance, winter hardiness and yield of present day wheat varieties and in the great increase in sugar production due to the creation of canes resistant to mosaic.

Many further problems however still await solution.

39. P. L. 633.1:575(49.3)
 A la Station de l'État pour l'Amélioration des Plantes. (**The State Plant Breeding Station.**)
 Sillon Belge 1932 : 1 (5).

A very brief popular account of plant breeding at Gembloux, with special reference to breeding wheat for resistance to disease, etc., yield, earliness and quality.

40. *AVDULOV, N. P. 633.1:576.312:576.16
 (Karyo-systematic investigations in the family Gramineae.)
 Suppl. 43 Bull. Appl. Bot. Genet. and Plant-Breed. 1931 : 428 pp.

The views of earlier authors on the systematics of the graminaceous plants are reviewed. The author points out how mere chromosome numbers are of secondary systematic value, whereas the methods of Levitsky, studying the chromosome morphology, etc., have produced very considerable elucidation both of the systematics and the phylogeny and interrelationships of many groups.

Starting with the classification of Hackel, the author has, on the basis of his karyological findings together with a certain number of morphological characters found to run parallel with these, constructed a new and more nearly natural classification of the family. A particular type of leaf anatomy is found to be associated with an elliptical or lanceolate first leaf, which grows horizontal, various other morphological peculiarities, simple starch grains, an entirely tropical distribution and small chromosomes, invariably in multiples of 9 or 10. This group of genera is therefore given the status of a sub-family, *Sacchariferae* (Harz) Avdulov.

The second sub-family is characterized by a different type of leaf anatomy and is called *Poateae* (Hitchcock) Avdulov. One of the groups—*Phragmitiformes* (Harz) Avdulov—comprising this family possesses small chromosomes in multiples of 12, simple starch grains and many features

* A full summary of this paper is on file at the Bureau.

characteristic of a primitive grass type, the second group—*Festuciformes* Avdulov—has large chromosomes in multiples of 7 or less and is peculiar in the linear and erect nature of the first leaf, composite starch grains (with certain exceptions) and limitation to the northern temperate and cold zones; also in the failure ever to develop the colourless zone round the nucleolus of the resting nucleus in presence of acetic acid, a phenomenon so characteristic of the small-chromosome group.

Various lines of argument are presented which lead to the conclusion that the grass prototype must have been a plant with hexamerous flowers, broad elliptical and horizontal first leaf, composite starch grains and small chromosomes in multiples of 12. Evolution is regarded as having taken place in the direction of reduction of the floral numbers. In the first stages of evolution there was an increase in size of the chromosomes, followed by a reduction in their basal number. This latter process finally continued without a corresponding increase in size to compensate for the reduction in chromatin in the genera with 6 and 5 as the basal number. The final stages of evolution have also involved changes in the disposition of the chromatin in the chromosomes.

This outline is more especially true of the *Festuciformes* which have passed into the cold regions of the earth and a striking parallel is drawn between this process and the known temperature changes leading to the glacial period and the present day temperate period, when the total amount of chromatin is tending to fall again. The *Sacchariferae*, which have remained in the tropics, have not suffered any appreciable change in chromosome size and their number has never fallen below 9. They have on the other hand developed a special type of leaf anatomy and simple starch grains.

A special section of the *Festuciformes*, the *Fruentaceae*, containing the most prevalent cereals of temperate lands and characterized by small starch grains, may have developed from the *Festuciformes* or independently from a primitive ancestor.

It is significant that polyploidy has played little or no part in the major evolution of the genera, its influence being confined to evolution within the genus and frequently within a section of the genus.

41. BERKNER, F. and SCHRÖDER, H. 633.11
Untersuchungen über die morphologischen Merkmale zweier Weizensorten in ihren Beziehungen zueinander und zum Witterungsverlauf. (*Investigations on the morphological characters of two varieties of wheat in their relations to each other and to the climatic conditions.*)
Z. Züchtung 1932: A. 17: 474-84.

The varieties shewed similar correlations and their characters varied in the same way. The effects of rain and temperature on the various characters over a seven year period are tabulated.

42. PISSAREV, V. 633.11(47)
Das Problem der Verbreitung des Weizens nach Norden in der Sowjetunion. (*The problem of the northward extension of wheat in the Soviet Union.*)
Züchter 1932: 4: 185-91.

The limits of wheat cultivation correspond roughly with those of the black earth soils except in White Russia and some other districts where there is no black earth soil and where the areas under wheat are scattered.

Western Siberia and Kasakstan are the main wheat districts of Asiatic Russia but on account of the severity of the winters, only spring wheat is grown.

A large area surrounding Moscow constitutes a curious exception from the general rule and is named by the author "the white patch." Here wheat is little grown, partly on account of drought, soil conditions and frit fly.

The differences in the culture and forms of wheat of the north constitute further proof of their independent origin. "*Sibiricum*" is the main type and its occurrence coincides with the wanderings of the Ugro-Finns.

By the production of higher yielding varieties more winter hardy or, for spring wheats more early ripening, the yield of wheat has been increased and further experiments are in progress to produce varieties suitable to the various districts.

43. HARIG, G. 633.11:575(7)
 Wirtschaftliche und biologische Grundlagen für die Verlagerung der Weizenanbaubetriebe in Nordamerika. (Economic and biological bases for the extension of the wheat-growing districts in North America.)
 Kühn-Archiv 1932: 33: 123-92.

A general account of the development of wheat-growing in North America including the results of breeding work.

44. WUNDER, B. 633.11:575(83)
 Die ersten Erfolge landwirtschaftlicher Pflanzenzüchtung in Chile. (The first results of agricultural plant-breeding in Chile.)
 Tropenpflanzer 1932: 35: 64-70.

The first agricultural experimental station was founded in 1923 at Santiago which has a climate resembling that of North Italy. Because of the extension of the country north and south the climatic conditions as a whole vary enormously.

The average rainfall and temperature for Santiago are given and the yield of some of the varieties of wheat grown over a 6 year period. Of these, Ardito, Artigas, Richelle de Napoles, Oregon, Australiano and Florence have been used for breeding. With the exception of Florence all yield above the average and Florence has other necessary qualities.

The variety trials are made according to von Rümker's method and individual selection and crosses are being carried out.

Chile has no indigenous varieties but some of the varieties already mentioned have been grown for years and have become so thoroughly acclimatized that they may be regarded as land varieties. Besides these, Bena and Yandilla King have recently been introduced. Pure line breeding is being undertaken and increase in yield has already resulted.

45. SAPÉHIN, L. 633.11 T. durum :575.11.061.6:581.45
 (Genes for leaf colour in hard wheats I.)
 Bull. Lab. Genet. Leningrad 1932: 9: 47-68.

In the F_2 of a cross between 2 sorts of *T. durum* var. *melanopus* albinos appeared, in both 3:1 and 15:1 ratios. These ratios were substantiated by F_4 results. Two recessive factors are established, e_1 and e_2 . In some families a slight excess of albinos was observed.

In crosses of one of these two parents with a pure line of *T. durum* var. *hordeiforme* albinos appeared in some F_3 families, again in 3:1 and 15:1 ratios. The ratio of the families giving no albinos, 3:1 and 15:1 made the presence of three factors very probable, especially in view of the absence of albinos in the F_2 . A later F_2 of the same cross however, shewed a clear di-hybrid segregation. Crosses between the lines which differed in the two crosses gave no albinos and their factorial composition is therefore identical, viz. $E_1 E_1 e_2 e_2$, the common parent being $e_1 e_1 E_2 E_2$. The parent which was alike in these two crosses was crossed with two more *durum* lines and one *durum* type with 28 chromosomes from a *durum* x *vulgare* cross; di-hybrid ratios were again obtained in all cases and intercrosses again shewed that these three lines had the same formula $E_1 E_1 e_2 e_2$.

A line of *T. dicoccum* gave tri-hybrid ratios with some of these $E_1 E_1 e_2 e_2$ lines and with the $e_1 e_1 E_2 E_2$ line 7:1 ratios, shewing the existence of two groups of genes, one of each of which must be present for chlorophyll formation; the two groups are $E_1 E_1 E_2 E_2$ and $E_4 E_4 E_5 E_5 E_6 E_6$. A yellow type was found in the progeny of a plant of *T. durum* var. *hordeiforme*, which was otherwise uniform. The character proved to be dependent on a single recessive f_1 and is thought to be a mutant. A somewhat different yellow type appeared in a cross between var. *apulicum* and var. *leucomelan* of *T. durum* and proved to be dependent on two factors, which are therefore designated F_3-f_3 and F_5-f_5 .

The author points out that these results shew the existence of trimerous factors in the tetraploid wheats but admits the possibility that they are part of a tetrameric system.

For all the crosses the data are tabulated and the probabilities according to the chi squared method are given.

46. LIEPIN, T. 633.11 *T. polonicum*:575.113
 (Inheritance of quantitative characters in durum wheats. III. The
 manifold effect of the principal gene of the glume length of *Triticum*
polonicum.)
 Bull. Lab. Genet. Leningrad 1932: 9: 29-46.

The hybrids between *T. polonicum* and the other 28 chromosome wheats were distinguished by having the glumes the same length as the spikelet, whereas in *T. polonicum* they are longer and in the other species shorter than the spikelet. They differ also in that *T. polonicum* has longer and laxer ears, wider glumes and longer grain.

Data are given which shew that the plants homozygous for the P factor governing glume length also display the longest grains, longest and laxest ears, larger number of spikelets per ear, shorter awns in crosses with *T. durum*, shorter empty glume teeth. The same basal gene P evidently influenced all these characters. The heterozygotes were mostly intermediate.

The length of straw was not influenced by this P gene, nor the breadth of the glumes.

An analysis of various pure lines shewed that the glume length was phenotypically correlated with the length of the ear and the density but that this is a completely different type of correlation is shewn by the fact that in this case the glume length was also correlated with breadth but not with any of the other characters genetically correlated with glume length.

No case was observed of crossing-over between these genetically correlated characters and it is thought most probable that all characters are governed by the same gene. Adding these characters to those observed by other authors to be correlated with glume length a total of 16 characters governed by the 1 gene is obtained.

In addition to this, each character is also influenced by a series of other genes, sometimes specific to itself, sometimes also pleiotropic, which intensify both the dominant and the recessive effect of the basal gene P. Philiptchenko's unpublished work has shewn that ear length and density in the soft wheats are influenced by not less than 20 pairs of such modifiers and the analysis of these characters in the second and later generations of the present crosses shew that several such genes are at work.

This is a striking proof, the author remarks, that "the development of any part of the organism depends not on isolated genes but on the genotype as a whole."

47. BLEDSOE, R. P. 633.11:575.127:633.14
 A rye-wheat hybrid.
 J. Hered. 1932: 23: 181-85.

A hybrid is described which resulted from the cross of Abruzzi rye x Chinese wheat. In plant characters the hybrid resembled the rye, in ear characters the wheat parent. In the latter characters the hybrid was identical with the reciprocal wheat x rye hybrid. A few seeds were produced by open-pollination, still fewer by backcrossing to rye.

48. VASILJEV, B. 633.11:575.127:633.14
 (Wheat-rye hybrids. I. An analysis of the first generation of various
 wheat-rye hybrid combinations.)
 Bull. Lab. Genet. Leningrad 1932: 9: 69-87.

A short sketch of the history of wheat-rye hybrids since their first production by Wilson in 1875 is given. The Saratov work has shewn that certain lines of wheat give much better results than others, especially Turkestan wheats (*graecum*) and a particular Chinese race gave up to 100 per cent of fertilization. *T. durum* crossed with extreme difficulty.

In the studies here described the author pollinated various wheat lines with the same race of *Secale cereale* L. Out of 20 wheats, 10 hard and 10 soft, only 11 gave results, viz. 7 of *T. vulgare*, 1 of *T. compactum*, 2 of *T. Spelta* and 1 of *T. persicum*. Round about 2,000 florets were pollinated each year from 1927 to 1929. Although the *durums* gave grains in equal quantities they never germinated, whereas the grains from the soft wheats germinated well; in 1929 hybrid grains were obtained from all the soft wheats used, including Prelude which was on various grounds of dissimilarity regarded as one of the most improbable; the percentage success, however, was only 0.44. From 6½ thousand flowers pollinated, in all 507 grains of 104 plants were obtained.

The greatest number was produced by *T. vulgare* var. *erythrospermum irkutianum*. The soft wheat hybrids in length of straw resembled the rye parent. In length of ear heterosis was observed in almost every case. The number of spikelets per ear was in most cases nearest to the number in rye, in 2 cases intermediate. The ears were almost in every case narrower than those of the parents, being usually closer to the rye than the wheat parent. Similarly the length of the individual spikelets is nearer in most cases to rye than to wheat, in one case longer than either. The glume length was usually of the wheat type.

The single hybrid with *T. persicum* was like wheat in straw and glume length, number of spikelets, greater than either parent in length of ear and spikelet and breadth of ear and less in thickness of ear.

Statistical studies were made of the variation of the hybrids with *erythrospermum* in the 3 consecutive years. The variation of the hybrids was less than that of the parental forms in 1928 and 1929, greater in 1930. The low variation is probably the result of the small number of plants.

The hybrids with the early wheats headed later, those with late wheats earlier than the corresponding wheat parent and those with wheats of medium ripening headed simultaneously with the parents. All the hybrids seemed to ripen considerably later than the parents, especially the spelt hybrids.

49. POWERS, L. 633.11:575.127.2:575.22:576.356

Cytologic and genetic studies of variability of strains of wheat derived from interspecific crosses.

J. Agric. Res. 1932 : 44 : 797-831.

The amount of variation observed in strains of Marquillo led to a cytological examination of the reduction divisions of the pollen mother cells of this wheat and those of plants of Marquis and Minnesota 2303 (a selection from Kanred x Marquis) for comparison.

The chromosome number of 32 plants of Marquillo and 27 of Marquis was found to be 42, except in two plants of Marquillo which had 41. The microspores of these two plants shewed 30.3 and 25.8 per cent of micro-nuclei. In the 42 chromosome plants of Marquillo, Marquis and Minnesota 2303, the percentage of microspores shewing micro-nuclei was 2.8, 0.8 and 0.8 respectively and the coefficient of variability 46.0, 53.7 and 38.7. Extrusions of karyotin were noticed in the microsporocytes of Marquillo and Marquis.

Non-orientation of chromosomes was observed during the stages preceding metaphase; 6.1 per cent of the cells of Marquillo examined shewed this condition and 7.7 of those of Marquis. Their subsequent behaviour suggests that these lagging chromosomes may form micro-nuclei.

Non-conjunction of chromosomes was also observed during metaphase in both Marquillo and Marquis, as well as the related phenomenon of polyvalence. The amount of polyvalence, however, did not account for the high percentage of non-conjunction; 6.3 per cent of the microsporocytes of Marquillo shewed pre-disjunction and 2.8 per cent of those of Marquis but this condition probably does not give rise to micro-nuclei.

Fragmentation occurred in both Marquillo and Marquis.

The progeny of some of the plants of Marquillo investigated cytologically were examined for the percentage of abnormality and the behaviour of the univalents.

The results of a study of the correlations between the cytological abnormalities indicate that non-orientation and non-conjunction are associated with the production of micro-nuclei but not pre-disjunction. There was no correlation between non-orientation and non-conjunction.

There was correlation between the cytological aberrations and the coefficients of variability of weight of seed per plant, height of plants and fruitfulness of the progeny of Marquillo.

The percentage frequency of micro-nuclei, non-orientation and non-conjunction was found to be negatively correlated with average weight of seed per plant, average height of plants and percentage fruitfulness and non-conjunction alone with percentage emergence and percentage matured. The amount of natural crossing observed, 7.2 per cent, shews that this is not responsible for the variations.

It is concluded that though Marquillo shews greater variation than Marquis and this variation is probably due to cytological aberrations, the results with Minnesota 2303 shew that it is possible for an interspecific hybrid to have a germinal stability as great as that of Marquis.

50. POWERS, L. 633.11:575.127.2:575.22:576.356
Cytological aberrations in relation to wheat improvement.
 J. Amer. Soc. Agron. 1932 : 24 : 531-36.

This is a continuation of the work reviewed in the previous abstract. The percentage frequency of the occurrence of non-orientation in Marquis, Marquillo and Minnesota 2303 was 6.9, 10.8 and 6.8 respectively and for non-conjunction 7.7, 6.1 and 3.4.

The coefficients of correlation for micro-nuclei with non-orientation and non-conjunction and for non-orientation and non-conjunction were positive for all three varieties except in Minnesota 2303 for micro-nuclei and non-conjunction but were significant only for Marquis and Marquillo in the case of micro-nuclei and non-orientation. It is possible that the occurrence of micro-nuclei may prove to be a convenient measure of variability in the plant.

The coefficients of correlation were calculated between the types of chromosome aberrations of the parents and the coefficients of variability and means of the characters—weight of seed, height of plant and fruitfulness of the progeny. The results possibly indicate that as regards the cytological aberrations Minnesota 2303 represents a homogeneous population while Marquillo and Marquis represent populations that are heterogeneous.

51. MORIYA, M. 633.11:575.127.2:576.312.35:581.162.51
(Chromosome numbers and fertility relations in the progeny of a hypopentaploid *Triticum* hybrid with 34 somatic chromosomes.)
 Jap. J. Genet. 1932 : 8 : 34-48.

The hybrid was the result of a cross between a dwarf plant with 40 chromosomes and *T. polonicum* and shewed $14n + 6i$ at the first metaphase.

The fertility of the hybrid was 31 per cent when isolated and 5 per cent of the grains germinated. The various chromosome combinations found among the progeny are tabulated. About 69 per cent of the plants were fertile, the rest sterile.

The original plant belongs to Kihara's "decreasing" group, with a tendency to revert in time to 28 chromosomes.

Fertility increases with the decrease in the number of univalents. An individual with $15n$ was found. It was dwarf and quite sterile.

52. HOLLINGSHEAD, L. 633.11:575.127.2:576.354.46
Partly fertile hybrids of common wheat with Khapli Emmer.
 J. Hered. 1932 : 23 : 247-53.

The attempts to transfer the high stem rust resistance of Khapli Emmer (*T. dicoccum*) to varieties of *T. vulgare* had proved unsuccessful. A cross was therefore made with H-44-24, itself the result of a cross between Marquis and Yaroslav Emmer and Khapli Emmer. Of 128 flowers pollinated 58 set grain.

The seedlings shewed a resistance to stem rust slightly less than the Emmer parent but considerably greater than H-44-24. The hybrids had a high degree of sterility and were unable to withstand adverse weather conditions.

The pollen mother cells of the F_1 hybrids were examined cytologically and they usually shewed 14 bivalent and 7 univalent chromosomes. About 20 per cent of the cells, however, shewed a higher proportion of univalents. An examination of hybrids of Marquis x *T. dicoccum* var. Vernal shewed about 18 per cent of such cells. The mature pollen of the Khapli Emmer hybrids contained from 34 to 51.4 per cent of empty grains which probably partly accounts for their sterility.

53. WAKAR, B. A., KROT, E. G. and BREKINA, L. A. 633.11:575.127.2:576.356
Zytologische Untersuchungen über F_2 der konstanten Bastarde zwischen *Triticum vulgare* Vill. x *Triticum durum* Desf. (Cytological investigations on the F_2 of the constant hybrids between *T. vulgare* Vill. x *T. durum* Desf.)
 Z. Züchtung 1932 : A.17 : 451-73.

Except for one which was of *vulgare* type, all the 10 hybrids studied were of the unawned *durum* type. Of the latter, all shewed 14 bivalents in the pollen mother cells at diakinesis and only

in one case were they of the open type. In a side view at metaphase, chromosomes left at the poles were frequently observed in all the hybrids, lagging chromosomes at anaphase in all the *durum* hybrids and occasionally fragments of chromosomes. Telophase was usually regular at the first and always regular at the second division.

It is suggested that such irregularities shew that chromosome relations are still unbalanced and this may be why a sufficiently fertile unawned *vulgare* x *durum* hybrid has not yet been obtained.

54. DUSSEAU, A. 633.11:575.127.2:576.356.5
 Sur un hybride *haplodurum* issu du croisement de deux *Triticum vulgare*.
 (A hybrid *haplodurum* from a cross between two *Triticum vulgare*.)
 C.R. Acad. Sci. Paris 1932: 194: 1380-82.

The origin is reported of a wheat of the *durum* type, in the F_2 of a cross between two sorts of true *T. vulgare*. The plant bred true, although some of the sister lines shewed considerable segregation, and examination proved it to be in every respect identical with *T. durum*.

Cytological examination shewed the plants to possess only 14 somatic chromosomes and they are thus regarded as haploid *durums*.

55. KATTERMANN, G. 633.11:575.183.061.6
 Farbexien bei Weizenkreuzungen und das erbliche Verhalten blaufärbter
 Aleuronschicht bei der verwendeten neuartigen Weizenrasse im allgemeinen.
 (Colour xenia in wheat crosses and the hereditary behaviour in general
 of the blue aleurone layer of the new type of wheat used.)
 Z. Züchtung 1932: A.17: 413-46.

It is suggested that the blue grained wheat used in these crosses originated from a wheat-rye cross. When this strain was pollinated with pollen from a white or brown grained strain the first seed generation (SG_1) was white or only very lightly coloured. No change was observed in the reciprocal cross. The segregation ratios in SG_2 and SG_3 indicate that two factors are present, F for colour in the aleurone layer and H an inhibitor. A genotypical classification of the phenotypes is difficult. All seeds with three F genes are blue but the effect of only two or one F genes is uncertain. With 1-3 F + 1 H the grains are either grey or white. The segregation of these types is very variable and the behaviour of the combinations is described as labile.

White grains may also be those without F genes or which possess two or three H genes. Attention is drawn to the occurrence of speckled blue and white grains in SG_2 and SG_3 which are attributed to a loss mutation in some of the cells of the aleurone layer. The relation of these results to similar work on rye by other workers is discussed.

56. DELAUNAY, L. N. 633.11:575.243:537.531
 (The X-mutations in wheat.)
 Bull. Lab. Genet. Leningrad 1932: 9: 173-80.

Ears of *Triticum vulgare albidum* 0604 were treated with X-rays before, during and after the reduction division, with doses rather similar to those used by Muller. Considerable sterility ensued and from 50 treated ears only 202 E_1 plants were produced; these gave rise to 12,000 E_2 plants.

The ears irradiated before the reduction division produced no mutants; the other 2 groups gave 8 undoubted mutants, i.e. 11.6 per cent.

Only 1 clear locus mutation was observed, viz. the dominant awnless (N) to awned (n), which appeared in the E_1 in the heterozygous condition and was detected on account of the incomplete dominance of the gene N. This plant in E_2 gave 56 NN:110 Nn and 58 nn plants. This is almost the only dominant varietal gene which the variety in question possesses and which could be expected to give a locus mutation of this kind.

A squarehead mutant occurred and may also be of the same type, viz. the K gene to k.

The remaining 6 cases are chromosome aberrations. The most extreme of these had 44 instead of 42 chromosomes, together with a large fragment, and was completely sterile. The rest displayed

varying degrees of fertility but shewed deviations from the 1:2:1 ratio in E_2 , consequent upon the irregularities in the reduction division.

One of the typical cases of this was the speltoid appearing in E_1 as heterozygote. Of the 106 E_2 plants forming the progeny of this plant, 51 were normal, 52 heterozygous speltoids and only 3 homozygous speltoids. This low proportion of speltoids can only be explained by a failure to develop on the part of the zygotes of this constitution. The homozygous speltoids have a greater awn development than the normal, also longer glume teeth, as if the action of the N gene were to some extent inhibited.

Another mutant type was an individual with only 41 normal chromosomes and 1 fragment. The glumes were narrow and had awn-like teeth and the plant produced only 4 grains. These gave an E_2 which differed markedly from the normal and from the E_1 . The fragment in 1 of these plants proved to be longer than in the E_1 plant and possibly had become attached to the univalent in reduction division and removed part of its chromatic material. The appearance of this unexpected type illustrated the continuance of the mutational process in generations after the one receiving the X-rays.

The third type was a plant with narrow elongated ears and this time 2 chromosomes below the normal length appeared, giving in the following generation 12 normals, 10 heterozygous speltoids, 1 homozygous speltoid, 2 plants like itself, 1 agropyroid type and 1 plant of doubtful type. It is probable that other types would have appeared but for the low fertility of the original mutant, whose reduction division must have been highly irregular and so have led to the formation of many further mutational products.

57. JAKOVLEV, M. S. and NIKOLAENKO, E. I. 633.11:581.45
(The number of vascular fibrous bundles in the coleoptile of wheats, as a systematical character.)
 Bull. Appl. Bot. Genet. and Plant-Breed. 1931 : 27 (4) : 285-321.

Examinations were made of the coleoptiles of 820 samples of wheat from all over the world. The Abyssinian forms of *Triticum dicoccum*, *durum*, *turgidum* and *polonicum* were all characterized by large numbers of coleoptile bundles, in *T. turgidum* and *durum* a few cases of as many as 7 being observed. Taking *T. turgidum* and *durum* together 67.8 per cent of the plants had more than 2 bundles, the commonest number being 4.

The 28 chromosome wheats from India and Arabia shew the same characteristics, those from all other countries and other species rarely have more than 2.

T. persicum did not have such large numbers and there are no grounds for including this species in the Indo-Abyssinian emmers.

58. WUNDER, B. 633.11-1.557:551.56
 Ueber den Einfluss der Witterungsverhältnisse auf Ertrag und Qualität verschiedener Weizensorten. **(On the influence of weather conditions on yield and quality of various wheat varieties.)**
 Fortschr. Landw. 1932 : 7 : 166-73.

The year 1930 was marked by an exceptionally bad harvest in Chile, the weather for that year was also abnormal.

A careful comparison of rainfall and temperature during the period 1925-1930 and the yield of 15 varieties of wheat indicated that certain combinations of the two at certain times of the year had a deleterious effect on the yield of wheat. The effect was greatest on the yield in kg. per unit area ; hectolitre weight, 1000 grain weight and grain content did not shew such marked differences.

The varieties of wheat grown responded differently to the different conditions. Ardito, Artigas and Oregon have shewn themselves to be among the best but further tests are needed.

Besides the directly injurious effect on growth of the bad weather, various secondary effects were observed, such as attacks by rusts and other organisms.

59. ROEMER, T. and KAMLAH, H. 633.11-2.451.2-1.521.6
Gibt es eine selektive Wirkung der Wirtspflanze (Weizen) auf den Pilz (*Ustilago*)? [Is there a selective action of the host plant (wheat) on the fungus (*Ustilago*)?]
Phytopath. Z. 1932: 5: 41-53.

This is a continuation of Grevel's work (see "Plant Breeding Abstracts," Vol. I, Abst. No. 55). The varieties Rimpaus roter Schlanstedter, Peragis, Grüne Dame and Heines Kolben were used as host plants for the three races of *Ustilago* found in Germany and the virulence of the fungus was tested on each variety for three consecutive years.

It was found that the virulence on certain varieties could be markedly altered according to which variety was used as host plant.

In the case of race 3, the most virulent form, two multiplications on Peragis or Heines Kolben followed by a multiplication on Rimpaus roter Schlanstedter changed the reaction to that of race 1.

These changes may be due to the fact that the populations used for infection may contain a small proportion of another race which increases more rapidly in the host plant and finally becomes the dominating form. Or, the populations may be made up of a number of physiological races on which the host plant has a selective action. It is to be assumed that this action will vary with the host plant.

The suggestion that the race undergoes some definite somatic modification is improbable.

Hybrids of crosses between the host varieties shew that resistance to races 1 and 2 can be combined with a medium susceptibility to race 3.

60. SMITH, R. W. 633.11-2.451.3-1.521.6:575.1
Note. Transferring smut immunity to hard red spring wheat.
J. Amer. Soc. Agron. 1932: 24: p. 663.

The hybrids of Komar, a hard, red spring wheat x Hussar, a hard, red winter wheat were increasingly immune to a mixture of 9 collections of smut which was chiefly *Tilletia levis* but contained some *T. tritici*.

The experiments were made on the plants with the spring habit of growth and selected F_5 plants proved to be immune when inoculated under controlled conditions.

61. JOHNSTON, C. O. and MAINS, E. B. 633.11-2.452 *P. triticina*:576.16
Studies on physiologic specialization in *Puccinia triticina*.
Tech. Bull. U.S. Dept. Agric. 1932: 313: 22 pp.

A full discussion of the subject. Thirty-nine forms occurring in North America are described.

62. ÅKERMAN, Å. 633.11:664.641.016
633.14:664.641.016
Erfarenheter rörande den svenska brödsädens kvalitet. (The quality of Swedish bread cereals.)
Tidskr. Finl. Svenska Landtm. 1932: 14: 159-61.

The baking quality of Swedish rye is good but varieties should be grown which are not so liable to germinate in the sheaf.

There are varieties of spring and winter wheat of good baking quality but varieties combining this with yield and straw stiffness, etc., are still desired.

63. MIÈGE, E. 633.11:664.641.016
La valeur boulangère des blés du Maroc en 1931. (The baking value of the Moroccan wheats in 1931.)
Rabat 1932. 125 pp.

The results clearly shew that the newly selected varieties are very superior in quality to the indigenous races.

64. BERG, K. H. 633.11 Aegilops :575.127:633.14:576.356.7
 Ueber zytologische Beobachtungen an *Aegilops triuncialis* x *Secale cereale*.
 (On cytological observations on *Ae. triuncialis* x *Secale cereale*.)
 Anz. Akad. Wiss. Wien 1931 : 68 : 225-26.
 Extract from "Autosyndese in *Aegilops triuncialis* x *Secale cereale*" in Z. Züchtung 1931 :
 A. 17 : 55-69, see "Plant Breeding Abstracts" Vol. II, Abst. No. 221.
65. LEWITSKY, G. A., MELNIKOV, A. N. and TITOVA, N. N. 633.14:576.312.36:575.12
 (The cytology of the offspring of the 16-chromosome rye.)
 Bull. Lab. Genet. Leningrad 1932 : 9 : 89-96.
 In crosses of 14 by 16 chromosome plants 1 plant had 14, 1 had 15 and all the remaining 13 plants
 examined had 16 chromosomes. The reciprocal cross gave 1 plant with 14 chromosomes.
 On repeating the experiments, the 14 x 16 cross gave 1 plant with 14, 1 with 15 v-shaped and
 1 headed, 16 with 16 and 1 with 17 (14 v-shaped and 3 headed). Various irregularities were
 observed in the 16 chromosome individuals. In the reciprocal there were 3 with 14 and 10 with
 16. Two of the latter again shewed irregularities.
 These figures show that the majority of the gametes, both ♂ and ♀, must possess 9 chromosomes.
 Crosses of 16 chromosome plants among themselves gave 4 plants with 16, 1 with 17 + a fragment
 and 10 with 18, 2 of the latter shewing irregularities. The additional chromosomes above 14
 were in every case headed. This again shews the high proportion of gametes which must have
 had 9 chromosomes.
 The 18 chromosome plants crossed amongst themselves gave 1 plant with 14, 1 with 16, 4 with 18
 and 2 with 20 chromosomes.
 The progeny of a free-pollinated 16 chromosome plant growing in a field of normal rye contained
 2 plants with 14, 6 with 16 and 5 with 18, the latter obviously from self-pollination.
 A 14 chromosome plant growing in the vicinity of a 16 chromosome plant gave 5 with 14, 6 with
 16, 1 with 18 and 1 with 25 (21 v-shaped and 4 headed). From these proportions it seems that
 pollination by pollen of the same chromosome number has occurred with equal frequency as
 with pollen of different chromosome number and that each of these have been equally favourable
 in effecting pollination.
 The 25 chromosome individual evidently arose by the fertilization of a diploid egg cell of a 14
 chromosome individual by a 7 + 4 gamete from an 18 chromosome individual.
 These plants with increased chromosome numbers are sometimes normally fertile, in the majority
 of cases, however, shew a marked reduction in fertility.
 The irregularities referred to consist of various phenomena of fragmentation, etc., and usually
 also appear in the offspring of the plants displaying them.
66. BEADLE, G. W. 633.15:575.11:581.162.51
 Genes in maize for pollen sterility.
 Genetics 1932 : 17 : 413-31.
 Fifteen simple recessive factors for pollen sterility are described. The character variable
 sterile-2 (v_{s2}) which is similar to v_{s1} described by the author in a previous paper, is described
 in detail and also one called warty anther (w_a) in which the microsporocytes degenerate in certain
 parts of the anther but develop normally in other parts. Short notes are given of the thirteen
 additional genes, m_{s4} to m_{s16} , all of which with one possible exception are non-allelomorphic.
 The degeneration of the microsporocytes which is characteristic of these male-steriles may
 occur at the same or at different stages.
67. CLARK, F. H. 633.15:575.11.061.6:581.45
 Inheritance of white sheath in maize.
 J. Hered. 1932 : 23 : 235-37.
 The plants studied had leaf sheaths varying in colour from light green to vivid white and the
 colour, or lack of it, may extend into the leaf blade. Crosses of these plants among themselves
 had a white sheathed F_1 though the greener colour was dominant. No definite ratios could be
 obtained in F_2 .

The character was recessive when crossed with normal green plants and the results agree with the presence of two independent factors designated ws_1 and ws_2 for the recessive character. The backcross data confirmed the results. The white sheathed plants were crossed with another white sheathed strain studied by Kempton. F_1 was white sheathed but classification was not possible in F_2 . Difference in modifying factors is suggested. No close linkage was found between sun-red, white cap, shrunken R aleurone or liguleless leaf. There were indications that there was a loose linkage with shrunken endosperm with a cross-over percentage of 46.86 ± 4.62 .

68. SPRAGUE, G. F. 633.15:575.11.061.6:581.48
The inheritance of colored scutellums in maize.

Tech. Bull. U.S. Dept. Agric. 1932 : 292 : 43 pp.

Colour in scutellums is due to presence of aleurone grains ; the colour mainly resides in their irregular envelopes, the remainder of the grain being nearly colourless.

Purple and red, which are related and dominant to absence of colour with one exception, are dependent on four dominant factors S_1, S_2, S_3 and S_4 (of which S_1 and two others must be present for the production of colour) interacting in the presence of the basic aleurone factors $A-C-R$ — pr (or Pr) and i . If pr is present red scutellums result, but with Pr scutellum colour is purple. As a rule, only kernels with purple or red aleurone have coloured scutellums, but occasionally a few with colourless aleurone and coloured scutellums are produced owing to heterofertilization. A factor S_5 which is dominant to purple or red but without influence on orange or yellow, gives dominant white. Orange and yellow scutellum colours are recessive to normal colourless ; orange is due to the presence of two recessive factors SO_1 and SO_2 , and yellow to one recessive factor Sy .

69. RHOADES, M. M. 633.15:575.116.1
The genetic demonstration of double strand crossing over in *Zea mays*.

Proc. Nat. Acad. Sci. Wash. 1932 : 18 : 481-84.

In crosses of trisomics of the constitution $\frac{Pr}{pr} \frac{V_2}{v_2}$ by diploids of the constitution $\frac{pr}{pr} \frac{v_2}{v_2}$ certain

plants arose of the constitution $\frac{Pr}{pr} \frac{v_2}{v_2}$ which could only arise from female gametes $\frac{Pr}{pr} \frac{v_2}{v_2}$ and

these could only arise as a result of crossing over of the chromatids in the double strand phase.

70. BEADLE, G. W. 633.15:575.127:575.116.1
The relation of crossing over to chromosome association in *Zea-Euchlaena* hybrids.

Genetics 1932 : 17 : 481-501.

The behaviour at meiosis of the C chromosome which occurs in both maize and the annual teosinte (*Euchlaena mexicana*) has been studied in the hybrids.

Crossing over in the long limb of the chromosome is about as frequent as in maize, in the short arm it rarely or never occurs. Chromosome association after diplotene was definitely related to crossing over.

The crossing over and chiasmata occurred chiefly in the region between the spindle attachment and the translocation point.

The conclusion is reached that spindle attachment homology has nothing to do with chromosome disjunction.

71. JENKINS, M. T. and BRUNSON, A. M. 633.15:575.14
Methods of testing inbred lines of maize in crossbred combinations.

J. Amer. Soc. Agron. 1932 : 24 : 523-30.

The coefficients of correlation for the mean values of a number of characters were calculated in crosses of inbred lines with other inbred lines and with commercial varieties or a varietal mixture and also for the inbred lines in two series of crosses with other inbred lines.

The method with open pollinated varieties is considered satisfactory for a preliminary testing of new lines.

72. BURNHAM, C. R. 633.15:576.312.36
An interchange in maize giving low sterility and chain configurations.
 Proc. Nat. Acad. Sci. Wash. 1932 : 18 : 434-40.

In a culture giving semi-sterile plants two plants were observed to have a low degree of pollen abortion. These plants had 8 bivalents and a chain of 4 attached to the nucleolus, shewing that the satellite chromosome is involved. Crosses with two distinct semi-steriles involving the P-br chromosome gave chains of 6 chromosomes, shewing that the P-br chromosome is also involved in the low-sterile.

Figures are given which shew that chromosome interchange has occurred at the very end of the chromosome, in the satellite itself. Gametes deficient for this small section of the chromosome apparently function.

73. BRINK, R. A. and COOPER, D. C. 633.15:576.312.36:581.162.5
A strain of maize homozygous for segmental interchanges involving both ends of the P-br chromosome.
 Proc. Nat. Acad. Sci. Wash. 1932 : 18 : 441-47.

Further data are presented with regard to the hybrid between 2 interchange plants involving a common chromosome, whereby the position of the interchange and of certain of the genes is made more clear. From the cross certain plants homozygous for both interchanges, characterized by still further reduced pollen sterility and a ring of 6 chromosomes, were produced. There is very little reduction in pairing even in the chromosomes suffering 2 translocations.

74. KIESSELBACH, T. A. and LEONARD, W. H. 633.15-1.557:575.12
The effect of pollen source upon the grain yield of corn.
 J. Amer. Soc. Agron. 1932 : 24 : 517-23.

The effect on yield in pollinating sweet corn with dent corn was calculated for acre yields as well as for individual plants. The two varieties were grown in alternate rows in two isolated fields in one of which the sweet corn was detasseled and in the other the dent corn. The results shewed a 34 per cent increase in the yield per acre of the sweet corn when pollinated with the dent variety. The yield of individual plants of sweet corn was increased 13 per cent by pollination with the dent corn.

The result of pollinating a selfed line with the pollen of another variety was a slight increase in the yield of the individual plant that was within the limits of the experimental error. The F_1 of a cross when pollinated with foreign pollen shewed no significant increase. The increase in yield when sweet corn is pollinated by dent corn is therefore the result of the change from sweet to starchy endosperm brought about by the foreign pollen.

75. JENKINS, M. T. 633.15-2.112-1.521.6:575.12
Differential resistance of inbred and crossbred strains of corn to drought and heat injury.
 J. Amer. Soc. Agron. 1932 : 24 : 504-06.

Inbred strains of corn differed markedly in their resistance to leaf burning in hot dry weather and this was likewise true of crosses between them. Crosses of the most resistant line L317B2 were also the most productive and breeding drought-resistant corn seems worth while.

76. SENN, P. H. 633.15-2.484-1.521.6:575.1
The effect of the sugary gene in corn on resistance to seedling blight caused by *Gibberella saubinetii*.
 Phytopathology 1932 : 22 : 675-97.

The seedlings from the non-sugary kernels shewed a significant resistance of 0.92 higher than that of the sugary seedlings.

The effect of seed-borne organisms on the degree of resistance to *Gibberella saubinetii* was studied but no material effect was observed.

Little, if any, correlation was found between degree of resistance and kernel weight. It is suggested that a number of factors are responsible for resistance to seedling blight, of which the non-sugary gene is one. The highest resistance is therefore not to be expected from varieties of sweet corn.

77. HUBER, J. A. *Einteilung der zweizeiligen gezüchteten Sommergersten. Ein Beitrag zur Sortenkenntnis der Gerste. (Classification of the two-rowed cultivated spring barleys. A contribution to the knowledge of the varieties of barley.)* Pflanzenschutz u. Pflanzenzucht 1932 : 8 : 252-56.

The characters of importance in classification are described and a survey is given of the barleys cultivated at the Institut für Pflanzenzüchtung und Pflanzenbau Weißenstephan der Technischen Hochschule München, according to Atterberg's classification.

78. KARPECHENKO, G. D. and IVANOVA, K. V. 633.16:575.116.1:581.46
(Linkage of genes I and G in barley.)
Bull. Lab. Genet. Leningrad 1932 : 9 : 97-108.

Varieties of barley with glumes 2.5—3 mm. in breadth were crossed with various varieties with glumes 0.7—0.8 mm. and the narrow glume proved to be completely dominant and the gene was designated I.

The presence of spicules on the glume nerves was also fully dominant to their absence and this gene was designated G in accordance with Ubisch. There were modifiers also influencing the spicules but these were not studied in detail.

Four cases in the coupling and one in the repulsion phase were observed and F_2 figures are tabulated which shew the linkage of the 2 genes, which the F_3 results confirmed.

The crossing-over determined in F_2 amounted to 13.7 ± 2.6 , in F_3 29.4 ± 1.4 and 41.5 ± 4.7 . Each individual cross shewed a lower crossing-over percentage in F_2 than in F_3 and it is thought possible that the difference may be caused by their having been grown under entirely different conditions in different localities. One of the F_2 families which was grown at the same place as the other F_3 's also had a high crossing-over percentage. It is also suggested that genes may possibly be present which influence the degree of crossing-over.

79. EKSTRAND, H. 633.16:576.356:575.1
Ein Fall von erblicher Asyndese bei *Hordeum*. (A case of inherited asyndesis in *Hordeum*.)
Svensk Bot. Tidskr. 1932 : 26 : 293-302.

Partially sterile plants were observed in a line of Puke barley, *Hordeum distichum nutans*. When crossed with normal plants, F_1 was completely normal and F_2 segregated into normal and partially sterile in a 3 : 1 ratio.

In 5 of the 6 plants investigated the heterotypic metaphase shewed 2 or 4 unpaired chromosomes in many of the cells, sometimes there were no univalents but even here the bivalents were not so closely formed as in normal plants. In general the reduction division resembles that of hybrids and other plants with only partial gemini formation.

In the sixth plant more than 4 univalents might be present and sometimes there were no bivalents.

Lagging chromosomes were observed in the homotypic division but no micro-nuclei were formed and after tetrad formation the anther sacs appeared perfectly normal. A large number of the pollen grains however degenerate later.

From the amount of female sterility it is assumed that similar irregularities occur in the megaspores.

As no plants with irregular chromosome number were found it is assumed that such gametes were non-viable.

The possibility that the non-formation of gemini is due to a specific gene, as has been found by Beadle in maize, is briefly discussed.

80. NAHMMACHER, J. 633.16-2.451.2-1.521.6:575.1
 Beitrag zur Immunitätszüchtung der Gerste gegen *Ustilago nuda* forma spec.
hordei. (A contribution towards the breeding of barley for immunity
 against *Ustilago nuda* forma spec. *hordei*.)
 Phytopath. Z. 1931 : 4 : 597-630.

The name *Ustilago nuda* forma spec. *hordei* is used in place of the usual *Ustilago nuda*.
 A method of artificial floret infection was used. Grain infection by the method of Tisdale and
 Tapke was tried without result.

The degree of resistance to the fungus of a large number of German and foreign varieties was
 tested. Crosses were then made between slightly susceptible and highly susceptible varieties,
 between highly susceptible varieties and between highly resistant and susceptible varieties.
 Only from the last kind of cross could resistant lines be selected.

In one cross resistance was clearly dominant and there was segregation in a 3 : 1 ratio but in the
 other crosses the results were not so clear and no definite conclusions can be drawn.

Two physiological forms were found. The test variety Mittlauer Hanna shewed an infection
 of 15.0-5.2 per cent with the form from "Original" winter barley and an infection of 71.7-83.0
 per cent with the form from "Original" spring barley.

81. ROSCHEVICZ, R. J. 633.18
 (A contribution to the knowledge of rice.)

Bull. Appl. Bot. Genet. and Plant-Breed. 1931 : 27 (4) : 3-133.

A full study has been made of all the wild rices of the world, their relationships one with another
 and with the cultivated forms.

The systematics of the subject is in a state of extreme confusion, even in the monograph by
 A. Prodhoe only 5 out of 20 species were described and 2 of these were synonyms.

Owing to difficulties of attaining access to herbarium material, the present work deals fully
 only with 18 of these species. The work claims no more than a preliminary character.

The history of the description of the genus is reviewed, followed by a detailed botanical description
 of the genus. On the basis of this the genus is divided into sections. It is seen that the genus
Oryza approaches most nearly to the genus *Leersia* of the other genera in the tribe *Oryzeae*.

A key to the wild species is given and the individual species described, certain new species in
 latin. Descriptions are also given of the forms within the species. Indications are given of
 the geographical distribution of these forms and of the variation existing within the species,
 with illustrations of typical plants. Indications are given of the relationships of the different
 species.

Some of the species have extremely limited distribution areas.

In the section on the origin of cultivated rices the author discusses which wild species are nearest
 to the cultivated ones. *O. sativa* L. f. *spontanea* is undoubtedly the nearest of all. This is a
 complex species and some of its characters resemble one, others another form of cultivated rice.
 This species corresponds in its area of distribution to that of the most ancient cultivation of rice
 and is almost certainly the progenitor of most of the cultivated rices. In addition to this
 certain cultivated rices of peculiar type appear to have arisen from *O. breviligulata*, *O. glaberrima*
 and *O. minuta*. It is also possible that *O. officinalis*, possibly by hybridization, has played a
 part in the origin of certain cultivated rices.

The main centre of origin of the cultivated rice is thought to be in India and Indo-China, the
 centre of diversity of the various distinct components of the species *O. sativa* L. f. *spontanea*
 being most probably in India.

Nevertheless the greatest number of species of the section *Sativa* occurs in tropical Africa, where
 panicle and spikelet types unknown in Asia occur. It is possible, therefore, that Africa contains
 the centre of origin of the section as a whole. The conditions in India and Indo-China have
 apparently been very suitable for mutation, thus producing the wealth of forms which have been
 taken into cultivation. China is regarded as the place from where the cultivated rices have
 emanated to the surrounding countries.

Hybridization has probably been an important factor in the process of origin of the cultivated
 rices and natural crossing between the wild and cultivated forms is still of frequent occurrence.

82. TAKEZAKI, Y. 633.18:575.061.2

(The inheritance of some lax panicles in rice.)

Jap. J. Genet. 1932 : 8 : 49-63.

Density is defined as the number of spikelets per cm. of panicle. On this basis four types were found, one normal and three degrees of laxness. Two factors, K_a and K_b are assumed. The double recessive represents a type not previously seen and can be produced by crossing the types $K_a K_a k_b k_b \times k_b k_b K_a K_a$.

83. JUACHON, P. B. 633.18:575.14

Inbreeding experiment with Hambas rice variety.

Philipp. Agric. (Abstract) 1932 : 21 : 62-63.

The observations were made on F_1 and F_2 and from the results the author concludes that increased production of bearing culms does not always mean an increase in grain production. F_2 plants yielded more grain but had fewer bearing culms than F_1 plants.

The control had the higher yield though fewer bearing culms.

84. KONDO, M. ET AL. 633.18:581.143.26.035.1

Untersuchungen über "Photoperiodismus" der Reispflanzen. Erste Mitteilung.

(Investigation on the "photoperiodicity" of rice plants. First communication.)

Ber. Ohara Inst. 1932 : 5 : 243-80.

The following experiments were made :—

1. The influence of long and short illumination during the seedling stage on the growth of the plant, the appearance of the panicle and the time of flowering.

The longer the time of lighting, the shorter but more intensive was the growth. Four hours light per day was too short and the plants died, with 8, 12 and 24 hours, however, growth was good. The appearance of the panicles was only affected by 8 and 12 hour illumination during the whole seedling stage when there was an early appearance first of one or two panicles per plant, the rest appearing much later than usual.

2. The influence of long and short illumination at different times during the growth of the plant on the appearance of the panicle, flowering and the development of the grain.

In general the effects were injurious, the appearance of the panicles was delayed and the development of the grain hindered. To hasten the appearance of the panicle the short illumination (5 hours) must be applied as early as possible to the plants. A daily illumination of 8 or 12 hours from time of sowing to flowering hastens the appearance of the panicles by 1-2 months.

3. The influence of day and night illumination for three years on the appearance of the panicle and flowering.

No panicles were produced during the period but at the end of the experiment when the plants returned to normal condition, they flowered and set grain as usual.

4. The relation between the individual parts of the plant and photoperiodicity.

A plant was divided into two, leaving the roots intact, one half was illuminated day and night, the other 8 hours per day.

The long day part of the plant was tall, with a large number of culms, very dark green leaves and no panicles, the short day plant remained short, with few culms and light green leaves, panicles appeared and the grain ripened early.

85. MUNERATI, O. 633.41-1.547.4

Sur la possibilité de la betterave de monter à graine la première année en Egypte et en d'autres régions à climat analogue. (On the possibility of beetroot bolting in the first year in Egypt and other regions with a similar climate.)

C.R. Acad. Sci. Paris 1932 : 194 : 1374-76.

It was shewn that strains isolated as shewing a marked tendency to bolting in the first year retained this tendency when grown in localities where bolting is never normally observed.

86. DORST, J. C. 633.491:575
 Aardappelveredeling en aardappelsoorten. (Potato improvement and potato varieties.)
 Veldbode 1932 : 30 : 747-49.

The importance of diseases and bud mutation in the loss of vigour and purity of a race is indicated. The present article is confined, however, to the production of new varieties from seed. Attention is drawn to the production of successful sorts in this way in the past, the stimulus being the necessity for disease-free lines. A very brief description is given of the results of cross-fertilization after which it is shewn that the work would be worth while if good wart-resistant races could be produced.

The lack of knowledge of the genetics of many of the valuable characters and of the origin of many sorts is referred to and it is also pointed out that even genealogical tables are not a sure indication of relative value of parents.

The possibilities created by the new collections of potatoes from South America are emphasized.

87. STEVENSON, F. J. and MILSTEAD, E. H. 633.491:575:578.08
 Potato breeding technique.
 Amer. Potato J. 1932 : 9 : 111-16.

For separating the seeds from large quantities of fruits a food grinder was used, water added and the seeds allowed to settle to the bottom. Various methods are described by which the mucilaginous material could be separated from the seeds.

New seed did not germinate so well as one-year-old seed and various experiments have been made in the attempt to break the rest period.

88. ASSEYEVA, T. 633.491:575.247
 (Bud mutations in the potato.)
 Bull. Appl. Bot. Genet. and Plant-Breed. 1931 : 27 (4) : 135-218.

A method is described in which by cutting away the eyes at a thickness of 1—2 mm. shoots can be produced from the lower layers of the tuber, thus revealing the genetic nature of these layers. In this way it has been shewn that many of the vegetative mutants of the potato have the mutant tissue only in the superficial layers, the central tissue giving rise to shoots identical with the normal, non-mutant type. Some have the epidermis only mutated, some the sub-epidermis only and some both the epidermis and sub-epidermis (dichlamyds). Within some commercial sorts examples of all these 3 types are found. The epidermal type is by far the most frequent and the other 2 types are thought to arise from this and not independently.

Coloured mutants of the second and third type are characterized also by pigmented stems, since the pigment in a stem is in the sub-epidermal layer; mutants of the first type have normal, unaffected stems. Similarly in loss mutations, only in types 2 and 3 is the stem also involved. Frequently the eyes are also of sub-epidermal tissue and in a similar way may come to have a different colour from the rest of the tuber, in consequence of which the sprouts will be different. On cutting away the eyes from the sub-epidermal mutants they partly give normals, as in the case of the epidermal mutants and partly give rise to dichlamyds. The dichlamyds only in 2 cases gave normals in this way. It is possible that in many dichlamyds not 2 but more layers of tissue were mutated.

In the genetical investigations the authoress assumes that in addition to Salaman's R factor there exists R_1 , which in presence of D does not produce colour. Otherwise her results more or less confirm Salaman's factorial scheme, except that the existence is indicated of a factor X inhibiting A which produces coloured eyes.

Results are presented which shew that coloured epidermal mutants segregate in a way identical with the corresponding normal uncoloured type. In the progeny of the dichlamydeous mutants on the other hand the mutant colour factor is very clearly transmitted, from which it is seen that in the mutants of Institut de Beauvais the recessive p has mutated to the dominant P. The reverse is true in Wohltmann mutants, where D has mutated to d.

Although the epidermal (and to a certain extent also the sub-epidermal) mutants were flecked with mutated and non-mutated tissue, the tubers of the progeny were either pure coloured or pure white.

Out of the 35 epidermal mutants observed, 10 were from dominant to recessive, 25 from recessive to dominant. The reason for this excess of dominant mutants is probably their greater ease of detection and the fact that white tubered forms are more prevalent than coloured. However, certain genotypes unmistakably seemed to have a greater tendency to mutate than others and white tubers with pink eyes displayed a particular tendency to mutate to purple.

Other more remarkable mutants are also described, one of which was characterized by flecks of purple, pink and white and gave a certain number of sectorial chimaeras of this alternating with white by the method of removing the eyes. Various cases were also observed where the eye colour as well as the tuber colour mutated. Another type of epidermal mutation gives the tuber a brownish colour mainly resulting from a rough texture.

Mutants of one or other of these types are not by any means uncommon and many of them have received distinct trade names and in some cases have replaced the original sort. Dominant mutants appear to be characterized by an increased luxuriance of growth, while for the recessive mutants the reverse is true.

In 5 cases the flower colour has mutated simultaneously with the tuber colour and in one of the sectorial chimaeras the flowers had the same sectorial nature. Other cases of flower mutation without corresponding change in the tuber were observed. White mutant flowers, it was noticed, were not free from faint traces of colour, thus differing from normal whites.

In addition to colour mutations, certain mutations of "form" were observed, amongst which were forms with 5 distinct petals, forms with composite inflorescences, various extreme types of leaf form and character, non-flowering forms of flowering sorts, parthenocarpic forms of sterile sorts, etc. Certain of these were different also in chromosome number. Most of the "form" mutants were less vigorous than the normal, although others were not so and some even appeared more vigorous. Amongst the mutants of this type, which gave yields considerably below normal, were the "wildings" and "semi-wildings."

It is pointed out that some of the changes produced in this way affect specific characters and would be sufficient to remove the new forms from the potato species altogether.

In examinations of 46 families from mutant plants, containing a total of over 1,500 seedlings, no disturbance of the Mendelian ratios was observed; this seems to prove that the mutants are true periclinal chimaeras, as opposed to "mosaics" of mixed tissue. Moreover the stems are never mottled as would have to be the case if the mutants were mosaics. The authoress admits that certain of the aberrant cases may possibly be explained by the assumption of this mosaic structure.

The present knowledge enables us to see that many cases described in the past as recessive mutations were in reality the appearance, from the lower layers, of the normal type from a dominant mutant type and the authoress questions whether the assumed greater frequency of recessive vegetative mutations is true in other plants besides the potato.

A considerable amount of material is quoted to prove that mutation occurs in a great variety of characters, including yield and disease resistance, both in a "positive" as well as "negative" direction, and so can give rise to new sorts. The true nature of a mutant can only be judged by inducing the mutant tissue to spread also to the sub-epidermal layer and so obtain sexual offspring. It is thought that the dominant mutations are true gene mutations, the majority of the "form" mutations being the result of chromosome aberrations.

A further group of "patched" types is described, certain of which are produced from the others by removal of the eyes. In this case, however, the original forms transmitted their peculiarities by sexual reproduction. The groups were exactly analogous to a number of types occurring with great frequency in the South American *Solanum andigenum*; there were forms with large coloured patches, giving rise to small-patched forms on removal of the eyes and on self-pollination giving rise to forms identical with itself, white forms with coloured eyes and white forms; on crossing with certain other varieties in addition to these 3 types, fully coloured and so-called hidden-coloured forms were produced. The removal of the eyes from the latter gave the so-called "spectacled" form, removal from the other forms, with the exception of the large-spotted, had no effect. The 2 derived forms on further vegetative propagation sometimes threw the form producing them,

A satisfactory explanation of these latter phenomena has not yet been found. In an addendum to the article it is reported that by various injuries to the eyes and by heavy doses of X-rays considerable numbers of the epidermal mutants were induced to give rise to dichlamyds, a result which is very much desired for investigating the nature of the mutations.

89. APPEL, O. 633.491:575.7
Die Bestimmung der Vitalität der Pflanzkartoffel. (The determination of the vitality of the potato.)
 Züchter 1932: 4: 199-202.

Since the normal development of the plant depends on a certain relation between the processes of oxidation and reduction, their measurement should give an indication of the healthiness or otherwise of the plant in question.

An electrical apparatus is described wherewith comparative measurements can be made on the tissue of potato tubers.

It was found that for tubers that are to grow into healthy plants the tension measured should not exceed 150 millivolts. If the tissue measured was between 150-190 millivolts the resulting plants tended to degenerate; if it went beyond 190 the plants were definitely unhealthy.

Experiments in which half of a tuber was measured and the other half planted, shewed a satisfactory agreement between the results.

The value of such an apparatus to breeders is pointed out, its cost only is against its use and efforts are being made to devise a simpler form.

90. DZHEVARLINSKY, G. P. 633.51:575(47)
(Zaknihi, its objects and attainments.)
 Bull. Zaknihi, Popular Sci. Ser. 1932: 21: 35 pp.

The section of breeding and genetics is concerned with increasing the productivity and quality of cotton and the rotation crops, "by selection and production of new sorts by the methods of analytical and synthetic breeding." The programme consists of examining the world collection of sorts and selecting those of practical interest by selection and crossing of pure lines. Lines suitable for Transcaucasia are desired and ultra-early lines for new cotton regions. In addition to productivity, good ginning out-turn, lint length and textile quality are desired for the hot regions and good ginning out-turn and earliness for the temperate zones.

The section for fodder crops is concerned with the production of superior types to make use of the water left over from the irrigation of cotton in autumn, winter and early spring.

91. WARE, J. O. 633.51:575.061.6:575.116.1
Inheritance of lint colors in Upland cotton.
 J. Amer. Soc. Agron. 1932: 24: 550-62.

Varieties of Upland cotton (*Gossypium hirsutum*) with three shades of brown and with green lint were crossed with varieties with white lint. The colour was always incompletely dominant in F_1 and in F_2 the segregations were monofactorial.

There was linkage between the fine texture of the lint and the green colour and coarse lint was dominant over fine lint.

92. VYSOTSKIĖ, K. A. 633.51:575.127.2
(New methods of cotton cultivation. Hybridization, vegetative propagation, new methods of transplanting.)
 NIHI, Moskow and Tashkent, 1932: 16 pp.

The question of high yield, especially of high-quality Egyptian sorts, is of primary importance. In this connection one of the most important measures is the cultivation of perennial types of Egyptian cotton and of first generation interspecific hybrids between American and Egyptian types, which have proved to be of very high quality.

The object in making these crosses was to unite in one sort the valuable lint qualities of the Egyptian (Sea Island) with the early maturity, large boll and high ginning out-turn of the

Uplands. The lines most outstanding in these respects were chosen from each type and over 30 combinations made in 1929, involving over 100,000 crosses.

The F_1 's displayed very marked hybrid vigour and were remarkably luxuriant. The characters are tabulated. The hybrids without exception shewed an increased boll production and a diminution in shedding, with a consequent increase in lint yield approaching, and sometimes exceeding that of the Upland parent.

In time of ripening the hybrids are intermediate, some being 7 days earlier than the standard sort Navrotski. In frost resistance they were superior to both parents and could therefore be sown earlier, over 10 days earlier than the Uplands.

The lint length is also intermediate, as also the thickness and tensile strength. The hybrids were very satisfactory in spinning quality and contained considerably higher percentage of oil. The percentage of cellulose in the fibres was somewhat higher and of salts somewhat lower in the hybrids.

Greatly improved methods of effecting the crosses have been elaborated. By just bringing together the flowers of each sort without previous emasculation a large quantity of crosses can be made in the time but a high proportion of self-pollination occurs. A better method consists in emasculating in the evening those flowers about to open the following day, pollinating them on the following morning with flowers of the male parent, one flower of which will serve to pollinate 6—10 flowers. The work of emasculation can be continued in the early hours of the morning. The removal of a certain number of flowers markedly reduces the loss by shedding. The seeds are sown at the rate of 20 kg. per ha.

The hybrid plants can be propagated vegetatively by grafting individual monopodia, entire sympodia, the main stem, roots or even individual leaves and the plants or parts of plants can be kept alive during the winter and the plant used thus as a perennial. The 2-year old plants give much higher yields than the 1-year old. The methods of vegetative propagation, transplantation, etc., are described.

These methods are being tried out for use in practice on a large scale.

93. VARUNTSIAN, I. and STAROSELSKAYA, A. 633.51-2.112
(Cotton varieties under various conditions of irrigation, Transcaucasian
Cotton Research Institute.)

Bull. Zaknihi Sci. Ser. 1932: 19: 63 pp.

In general the early varieties proved to be most drought-resistant. In each group sorts more and less drought-resistant were found.

94. HERIBERT-NILSSON, N. 633.584.3:575.129:576.356.5
Ueber das Entstehen eines ganz *Cinerea*-ähnlichen Typus aus dem Bastard
Salix viminalis x *caprea*. (The origin of a type identical with *Cinerea* from
a cross *Salix viminalis* x *caprea*.)

Hereditas 1931: 15: 309-19.

One bush had appeared among the hybrids which was intermediate between the two parental species but rather resembled a *viminalis* x *cinerea* hybrid. In the F_2 another peculiar plant appeared which was identified with *S. laurina*.

S. caprea has 2 factors for leaf form, 1 of which when it appears in the absence of the other, as it can in F_2 of crosses with another species in which both are absent, produces leaves of the *cinerea*-like, so-called *laurina* type.

The cross was repeated in later years and again a vigorous plant very different from the rest appeared. It proved not to be *laurina*, however, but an undoubted *cinerea*, with certain *viminalis* characters, which is shewn by descriptions and illustrations. In all important taxonomic characters it was identical with *cinerea*. It has an increased chromosome number, at least triploid and is in all probability tetraploid like *cinerea*, with which, moreover, it crosses with ease. With both parents it was completely sterile.

The origin of the polymorphic species *S. cinerea* is probably to be ascribed to the repeated occurrence of amphidiploid hybrids between these 2 species which grow together in a great many parts of Europe.

95. MENÉNDEZ RAMOS, R. 633.61(72.91)
Experiencias con variedades de caña en la Isla de Cuba. (Experiments
with cane varieties in Cuba.)
Rev. Agric. Habana 1932 : 13(12) : 23-54.

A rather detailed account of the results obtained with a number of new varieties and hybrids from various sources.

96. CERESA, G. 633.61:575(72.91)
Producción de "seedlings" de caña de azúcar. (Production of sugar cane
seedlings.)
Rev. Agric. Habana 1932 : 13(10) : 25-28.

The degree of flowering of various canes in 1930 was studied, with a view to determining which varieties produced successful seedlings.

97. KUNTZ, P. R. 633.61:575(72.95)
La producción de nuevas variedades de caña, y sus resultados experimentales.
(The production of new cane varieties and its experimental results.)
Bol. Dept. Agric. Com. Estac. Exptl. Insular Rio Piedras 1931 : 38 : 67 pp.

A brief outline is given of the methods of cane breeding and the results of tests of a number of new Puerto Rico varieties and imported canes indicated. The outstanding cane was P.R.803, which gave enhanced yields, being also immune from mosaic and reasonably resistant to other diseases. The cane and its performance are described and the method of its production indicated. Similar data are given for the new cane Fajardo Central No. 916, which is resistant though not immune, to mosaic.

98. LENNOX, C. G. 633.61:575(94)
The variety problem in Australia.
Hawaii Planters' Rec. 1931 : 35 : 21-26.

Attention is drawn to the large amount of introduction in the past and the consequent introduction of diseases.

A brief outline is given of sugar cane breeding in the past, then of that now in progress under the Bureau of Sugar Experiment Stations, the Colonial Sugar Refining Co. and the New South Wales Department of Agriculture, followed by an account of the varieties at present in cultivation.

99. BAKHTADZE, J. G. 633.71:575(47)
(The sorts of Abkhasian tobaccos.)
Bull. State All-Un. Assoc. Tobacco Ind., Inst. Tobacco Investig. and Abkhasian
Agric. Expt. Sta. Tiflis 1930 : 67 : 119 pp.

The different sorts are described and the types grown in the different regions are given.

An indication is given of how the replacement of the older sorts by more suitable ones has taken place, by selection on the part of the planter of introduced forms or among populations arising from natural hybridization—these arise particularly from the early-formed flowers, which, being few, tend to be cross-pollinated by insects.

The main problems in selection are the production of pure, high-yielding lines of high quality and resistance to fungous diseases. The local races are very heterogeneous and very marked effects can be produced by selection. Observations on a number of the lines selected out have shown that quality is connected not with one but with many independent characters. The most characteristic lines selected from the various local sorts are briefly described. Certain of these have proved very much superior in yield and quality.

Various characters on which the sorts could be distinguished were investigated. The best time for pollination was determined and crosses were made of various of the local sorts among themselves and with American sorts, using always one parent of high quality (aroma). The first generation was intermediate in all characters except the size of the middle leaves, which was greater. The second and third generations gave very complicated segregations.

Amongst other interesting plants observed in the study of the local sorts was one giant which grew to over 2 m. but never flowered and another type which produced 2 or 3 well-developed stems; the progeny shewed this character to be recessive.

Studies were also made of the collection comprising samples from all tobacco-growing countries of the world.

100. GOODSPEED, T. H. 633.71:575.243:537.531:576.312

Cytogenetic consequences of treatment of *Nicotiana* species with X-rays and radium.

Svensk Bot. Tidskr. 1932 : 26 : 147-62.

Dry seeds of *tabacum* were treated with heavy dosages of radium emanation and the embryos of the germinating seeds shewed abnormal mitoses; fragmentations, lagging chromosomes and chromosomes lying off the equatorial plate were seen. In the resting stage no abnormal condition could be observed.

Some of the progeny of a radiated plant shewing fragmentation were morphologically different from the normal type and from each other and some of these bred true in the following generations. Three pink-flowered forms occurred in the X_2 from a normally coloured (carmine) X_1 . Two contained fragments of chromosomes, the other was normal and the normal plant bred true for pink flowers, while plants with carmine flowers of the same generation segregated into pink and carmine in monohybrid ratios.

An investigation of a haploid pink plant shewed the presence of fragmentation and it is assumed that pink is due to an induced deletion and not to transgenation.

Plants are also found in X_1 with marked morphological differences from the control and a large flowered trisomic and two large flowered monosomics are described. The unpaired chromosome in these types is small.

Various types may arise among the progeny of plants with deformation of the vegetative and floral parts. These plants may exhibit "attachment" of chromosomes and there is evidence of "complex chromosome reorganization."

101. McCRAY, F. A. 633.71:576.356.5

Another haploid *Nicotiana tabacum* plant.

Bot. Gaz. 1932 : 93 : 227-30.

One plant only germinated from a number of seeds from the cross *N. tabacum* var. *angustifolia* x *glutinosa*. It proved to be a pure *tabacum*, produced abnormally low quantity of pollen and was smaller in certain respects than the mother *tabacum*. Cytological investigations shewed it to be a haploid and the reduction division shewed various irregularities, no true pairing being observed. In certain cases the chromosomes seemed to have divided, giving the possibility of the formation of occasional functional gametes with complete chromosome sets.

102. CLAUSEN, R. E. 633.71:576.356.5:576.16

Interspecific hybridization in *Nicotiana*. XIII. Further data as to the origin and constitution of *Nicotiana tabacum*.

Svensk Bot. Tidskr. 1932 : 26 : 123-36.

The data suggest that *N. tabacum* represents a hybrid of *N. sylvestris* x *N. tomentosa* with a doubled number of chromosomes.

N. tomentosiformis (previously but wrongly known as *N. Rusbyi*) closely resembles *N. tomentosa*. In the *tomentosiformis-tabacum* hybrid, as in the *tomentosa-tabacum* hybrid, the bivalents are smaller than those of the *sylvestris-tabacum* hybrid and a comparison of the morphological features of the hybrid *tomentosa-sylvestris* and *tomentosiformis-sylvestris* suggests that *tomentosiformis* is more likely to have been the progenitor of *tabacum* than *tomentosa*.

The results of crossing the monosomic types of *tabacum* with *sylvestris*, *tomentosa* and *tomentosiformis* and a cytological investigation of the hybrids shews that it is possible to locate a factor not only in a particular chromosome but also to determine the sub-genom to which it belongs.

Experiments shew that the P chromosome of *sylvestris* is homologous with the P chromosome of *tabacum* both cytologically and genetically, which implies that there is a doubling of characters in the *tabacum*.

103. WELLENSIEK, S. J. *De ontwikkeling van de cacao-selectie in 1931.* (The development of cacao selection in 1931.) *Bergcultures* 1932 : 6 : 697-98. 633.74:575.42(92.2)

On the ground of yields in 1930 and leaf measurements a further selection was carried out on the material preliminarily selected by Cohen Stuart and De Haan, 12, 12 and 14 trees respectively being retained in three plots. Selective thinning tests were carried out and certain other mother trees selected. Sexual progenies were laid out.

A correlation of $+0.50 \pm 0.22$ was found between the yields of certain mother trees and their clones, in another lot $+0.43 \pm 0.24$. The correlation of mother trees and seedlings was $+0.83 \pm 0.11$, thus very markedly higher. The yields of the seedlings were also much higher but also more variable.

Clear differences were observed between the clones in *Helopeltis* attack, some being almost free. The leaf measurements shewed a certain variation due to out-crossing, which proves that only those with white cotyledons should be planted in breeding for quality.

A rather high correlation ($+0.78 \pm 0.02$) was observed between the comparative position of a tree judged by number of fruits and judged by actual yield figures.

Observations have been made on the biology of the flower and artificial pollination, including preliminary observations on the yield increase resulting from this.

Crosses have been made between selected Getas Forastero and Satrian Criollo parents in the hope of combining high yield, quality and disease resistance.

104. WELLENSIEK, S. J. *Bloembioologische waarnemingen aan cacao.* (Observations on the floral biology of cacao.) *Arch. Koffiec. Ned.-Ind.* 1932 : 6 : 87-101. 633.74:581.162

A brief description is given of the opening of the flowers, the shedding of the pollen (which begins at about 5 a.m.), its germination artificially, which was most successful in water with a little sap from the stigma.

In nature the percentage of flowers pollinated is invariably higher than the percentage which develop fruit. With a Djati Roenggo hybrid the author observed percentages of pollinated flowers varying from 2.0 to 18.7, the total for one whole day being 11.2 per cent, 1,133 flowers being examined. Observations on other days rather indicated that the pollination is reduced by rainy weather. The time of day exerts a very marked influence, as also the variety. In Poerbojo Forastero as many as 47.6 per cent pollination was observed.

In Java there seems to be no intervention whatever of insects in pollination, although critical experiments to prove this have not been made. However the constant appearance of coloured cotyledons in trees normally producing only white ones proves the existence of cross-pollination. Artificial pollination by carefully removing a stamen early in the morning and tapping it against the stigma increased the percentage fertilization from 8.6 to 98.9.

By emasculating flowers in the evening and pollinating them with fresh pollen the following morning a success of 2 per cent ripe fruits was obtained. The stigma was shewn to be receptive before the stamens were mature and consequently by pollinating young flowers before the stamens have burst emasculation can, in the opinion of the author, be omitted. The flowers of the pollen parent are collected in the morning and preserved in corked flasks, the female parent being pollinated in the evening as soon as the flowers open. In this way the percentage of successes was brought up to 3.

105. WINGE, Ö. *Experiments with *Papaver rhoeas* L. f. *strigosum* Boenn.* *Bull. Lab. Genet. Leningrad* 1932 : 9 : 115-20. 633.75:575.115:581.49

Experiments to determine whether the form with appressed hairs on the peduncle was dominant or recessive to the normal form with spreading hairs were made repeatedly but failed to give conclusive results on account of self-sterility.

Crosses between 2 spreading-haired types gave a uniform progeny all spreading but in the progeny of 2 appressed types 190 appressed and 69 spreading were observed. Spreading x appressed in some cases also gave 1 : 1 ratios and other F_1 's from such a cross were all appressed. On crossing 2 of these latter F_1 's 347 appressed : 130 spreading were obtained. The spreading type is therefore dominant.

In all these results the recessive type was somewhat in excess. The recessive spreading plants also flowered later than the appressed type. The gene for hair type may therefore be linked with some other genes influencing flowering and vitality. This is also probably the reason for the predominance of the recessive type in nature.

106. YAMAMOTO, K. and SAKAI, K. 633.842:576.321.35

On the chromosome number in some *Solanaceae*.

Jap. J. Genet. 1932 : 8 : 27-33.

The chromosome numbers of a number of varieties of *Capsicum*, *Datura* and *Physalis* were determined. Twelve was the haploid number in every case except *P. angulata* where it was 24. The 12n found in *C. grossum* is not in agreement with the 6n found by Kostow.

Vilmorin and Simonet found 24n for *P. peruviana* instead of the 12n found by the present authors. The presence of polyploidy is therefore suggested.

107. HEUSSER, C. 633.912:575.12

Opbrengstcijfers van legitieme *Hevea* zaailingen in 1930 in den proeftuin Soengei Pantjoer. (Yield figures from legitimate *Hevea* seedlings in 1930 in the "Soengei Pantjoer" Experimental Garden.)

Arch. Rubberc. Ned.-Ind. 1932 : 16 : 101-56.

Tapping results and other observations are given for seedlings from 1920 crosses, from isolated seed gardens and from 1923 crosses.

The average total yield for 1930 from the 1920 seedlings was 34.94 g. and exceeded that of the previous year by 6.38 g. In general the yield of the good families shewed a greater increase than that of the bad families. The best families yielded as much as those of the best clones.

The coefficients of correlation for the yield during the different years are calculated and the results discussed in relation to the best time for selective thinning. In spite of the loss involved, early thinning is probably less detrimental than thinning too late.

Those trees which had shewn the best development in the early years still shewed the highest absolute increase in girth. Mother trees were selected from some of the seedlings from isolated seed gardens which shewed satisfactory yields.

The average yield of the plants from 1923 crosses was 3 g. lower than that of the previous year, probably due to the effect of the tapping height. The results confirm the suggestion that the yield of seedlings thinned selectively is not inferior to that of the best clones.

108. RAMAER, H. 633.912:581.331.2

De kieming van *Hevea*-stuijmeel. (The germination of *Hevea* pollen).

Arch. Rubberc. Ned.-Ind. 1932 : 16 : 328-48.

Various tests in artificial germinating media have shewn that failure of artificial pollination is not due to any lack of propensity on the part of the pollen itself to germinate. Nevertheless certain clones had degenerate pollen and it is advisable before planting out clones for seed production to test the quality of their pollen.

109. PISSAREV, V. 633.913:575

Ueber die Methodik der Züchtung der kautschukliefernden Pflanze "Guayule."
(On the methods of breeding the caoutchouc producing plant "guayule.")

Z. Züchtung 1932 : A.17 : 583-621.

For the original paper see "Plant Breeding Abstracts," Vol. II, Abst. No. 297.

- 634.11 Glorie van Holland
634.13 Provisie
110. LIJSTEN, R. **Two new varieties.**
Fruittelt. 1932 : 22 : 96-99.
The apple variety Glorie van Holland was found 50 years ago as a seedling, the pear Provisie similarly in 1915. They are described very briefly and illustrated.
111. SHAMEL, A. D. and POMEROY, C. S. 634.11:575.252
Bud variation in apples. A study of the rôle of bud mutation in deciduous fruit improvement.
J. Hered. 1932 : 23 : 213-21.
Bud variations in the apple may be of commercial importance. Their stability may be tested by bud propagation, either by top-working on to an older tree or budding on to selected nursery seedlings. The first method gives more rapid results but the second is considered more satisfactory.
The varieties Starking, Richared, Staymared, Blackjon and an unnamed variation of Esopus are all bud sports and differ from the original variety in increased depth of colour, which may in some cases develop very early. Closer observation may detect the presence of less obvious variations in taste, size, etc., which may be vegetatively propagated.
112. SMITH, C. O. 634.25:575.127.2:634.551
Two species hybrids. Hybrids of the Saucer peach of possible value as ornamentals.
J. Hered. 1932 : 23 : 167-72.
Hybrids between almond (*Amygdalus communis*) and peach (*A. persica* var. *platycarpa*) and between *A. mira* and *A. persica* are described and illustrated. Both hybrids appear suitable for ornamentals.
113. MOORE, C. N. and HASKINS, C. P. 634.323-1.547.4:537.531
Note on premature flowering in grapefruit from X-rayed seeds.
Science 1932 : 76 : 167-68.
The seeds were treated on March 8th, planted on March 16th and in the last week of May the plants shewed flower buds which opened on June 6th.
114. JULIANO, J. B. 634.443:581.162.51
The cause of sterility in *Spondias purpurea* Linn.
Philipp. Agric. 1932 : 21 : 15-24.
The stones of the fruit of *S. purpurea* contain no embryo and so fail to germinate. An investigation of the development of the reproductive organs shewed that pollen mother cells are formed but degenerate without forming tetrads.
Megaspore development is normal and the fruit is therefore parthenocarpic.
S. cytherea and *S. lutea* form normal pollen grains and crosses between these and *S. purpurea* might prove of value.
115. JULIANO, J. B. 634.61:581.46
Morphology of the male flower of *Cocos nucifera* Linnaeus.
Philipp. J. Sci. 1931 : 45 : 449-58.
The main stages of differentiation of the male inflorescence and organs are described. Considerable irregularity was observed in the microspores and not all of them were functional.
116. MAYER, A. 634.71:575.12
Diagnosen neuer *Rubus*-bastarden und -unterarten. (Diagnoses of new *Rubus* hybrids and subspecies).
Denkschr. bayer. bot. Ges. 1931 : 18 : 129-60.
Diagnoses are given for a number of subspecies and hybrids of *Rubus* occurring in the neighbourhood of Ratisbon, together with a species new for Germany, *R. Mercieri* Geneviev.

117. WEIDLER, R. C. 634.714:575.127.2:634.717
The youngberry.
 Bull. Fla. Agric. Expt. Sta. 1932: 57: 9 pp.
 Cross between loganberry and Austin dewberry.

118. FEDOROVA, N. 634.75:575.127.2:576.356.5
(Hybridization of *Fragaria vesca* L. with *Fragaria elatior* Ehr.)
 Bull. Lab. Genet. Leningrad 1932: 9: 109-14.

In the cross *F. vesca* ($2n = 14$) x *F. elatior* ($2n = 42$), 160 flowers were pollinated and in the reciprocal cross 120. Only the former succeeded. The same was true on repeating the crosses the following year, when 5,430 seeds of the direct cross were obtained. Only 15 of these gave mature plants however.

In vegetative organs these 15 plants are not all identical: 12 are very similar to *F. vesca* and 3 show more resemblance to *F. elatior*. These 12 also all had $2n = 14$ as in the maternal parent, 2 of the remaining 3 were tetraploids ($2n = 28$) and the remaining 1 pentaploid ($2n = 34$). The somatic chromosomes of these 2 latter types and of the parents are illustrated.

The origin of the pentaploid individual is ascribed to the union of a diploid egg cell with a normal gamete of *F. elatior*. The loss of 1 chromosome on gamete formation is not unknown in *F. vesca* and this would account for the number 34 in place of 35.

The authoress is at present inclined to regard the plants of the maternal type as having arisen by accidental self-pollination, at least until such time as the existence of apogamy in *Fragaria* is firmly established.

The high percentage of plants which perished is thought to be the result of the unbalanced chromosome condition of most of the hybrid seeds.

119. KAYSER, E. 634.835.094
 Contribution à l'étude des vins d'hybrides. (Contribution to the study of wines from hybrids.)
 Rev. Vitic. Paris 1932: 77: 120-24.

Figures are given for the analysis of the wines from various hybrids. These and degustation tests proved certain numbers to be highly satisfactory as table wines, in confirmation of observations of previous years.

120. WAGNER, S. 635.24:581.145
 633.854.78:575.12:578.08
 Ein Beitrag zur Züchtung des Topinambur und zur Kastration bei *Helianthus*.
 (A contribution to the breeding of the Jerusalem artichoke and to emasculation in *Helianthus*.)
 Z. Züchtung 1932: A.17: 563-82.

Of the various methods tried to induce flowering and fruiting in *Helianthus tuberosus*, the simplest and most certain method is to start the tubers in January and to keep the plants in the greenhouse. The formation of secondary tubers must be prevented.

Both self-sterile and self-fertile strains were found for *H. annuus* and *H. cucumerifolius*.

The methods for the emasculation of *Helianthus* are described and compared. That of Oliver, as modified by the author, is recommended.

121. FLORY, W. S. 635.31:577.8
 635.31:576.312
 Genetic and cytological investigations on *Asparagus officinalis* L.
 Genetics 1932: 17: 432-58.

Though there are differences between ♂ and ♀ plants, marked sexual dimorphism is absent; staminate and pistillate plants are produced in approximately a 1:1 ratio. Degree of development of rudimentary stamens in pistillate flowers is almost the same in different flowers of the same or of different plants, but the degree of development of pistils in staminate flowers is widely variable ranging from very rudimentary structures to almost normal ones. Attempts to bring about sex-reversal were unsuccessful.

The chromosome number is $n = 10$ for all the varieties studied and the chromosomes are unequal in size, six of them being larger than the remaining four. A detailed description of chromosome behaviour in micro- and megasporogenesis is given.

The author believes that the male plants are heterozygous for sex because the very few hermaphrodite flowers were borne on staminate plants. He interprets his results according to Correns's scheme of sex determination.

122. BUCHINGER, A. 635.34:576.341:575.42
 Ergebnisse der Selektion nach Saugkraft bei einigen Kohlarten. (Results of selection for osmotic pressure in certain *Brassicas*.)
 Fortschr. Landw. 1932: 7: 313-15.

By germinating in suitable solutions and selecting the seedlings which germinated first, individuals with high osmotic pressure were selected. These distinguished themselves by greater uniformity of development, superior form and quality in addition to very substantially greater yield and smaller amount of worthless product.

The experiments were carried out on various members of the *Brassica oleracea* group and consistent improvements were obtained with each one. The high and low osmotic individuals are illustrated and the yields for each are given.

123. SISA, M. 635.62:581.331.2
 (Relationship between the age and the viability of pollen in different Cucurbits.)
 Jap. J. Genet. 1932: 8: 19-26.

The results of germination tests of the pollen of varieties of *Cucurbita maxima*, *C. moschata* and *C. Pepo* showed that in a variety of *C. moschata* on the day before anthesis the rate of germination increased from the morning till 9 p.m. and decreased first slowly and then rapidly the next day; in another variety the decrease did not set in till the afternoon.

The variety of *C. Pepo* maintained a high germination rate until the evening after anthesis.

124. KRÜGER, M. 635.64:575.255
 Vergleichend-entwicklungsgeschichtliche Untersuchungen an den Fruchtknoten und Früchten zweier *Solanum*-Chimären und ihrer Elternarten. (Comparative developmental investigations on the ovaries and fruits of two *Solanum*-chimaeras and their parental species.)
 Planta (Berl.) 1932: 17: 372-436.

A detailed account of the morphological development of the fruit from its earliest stages in the chimaeras *S. tubingense* and *S. proteus* and their parental forms *S. nigrum* and *S. lycopersicum*.

125. KOSTOFF, D. and KENDALL, J. 635.64:576.356.5
 Origin of a tetraploid shoot from the region of a tumor on tomato.
 Science 1932: 76: p. 144.

Tomato plants were infected with cultures of *Bacteria tumefaciens*, as a result tumours formed on most of the plants and the stems were then cut off 3-5 cm. above the tumours.

Of 7 shoots formed directly from the tissue of the tumours, 2 died and of the remaining 5 one was found to be tetraploid with 48 somatic chromosomes. The plant resembled the original plant in appearance but had slightly larger flowers.

126. PRITCHARD, F. J. and PORTE, W. S. 635.64-2-1.521.6:575
 635.64 Break o' Day
 The Break o' Day tomato.
 Circ. U.S. Dept. Agric. 1932: 218: 4 pp.

The new tomato here described originated from a cross between Marglobe and Marvana. It is early, resistant to *Fusarium*, nail-head rust, several blights and blossom-end rot. It yields highly and over a prolonged period and possesses many other desirable features.

127. NOLLA, J. A. B. 635.646:575.11.061.6
Inheritance of colour in the eggplant (*Solanum melongena* L.)
 J. Dept. Agric. Puerto Rico 1932: 16: 19-30.

Plant, fruit and corolla colour, and striping of anthers, are inherited simply, showing 3:1 segregation in F_2 , with colour and striping dominant to absence of colour and non-striping. It is not clear whether these characters are controlled by a single factor or by several completely linked factors.

128. LAMPRECHT, H. 635.652:575.11.061.6:581.48
 Zur Genetik von *Phaseolus vulgaris*. III. Zweiter Beitrag zur Vererbung der Testafarbe. (On the genetics of *Phaseolus vulgaris*. III. Second contribution to the inheritance of the colour of the testa.)
 Hereditas 1932: 17: 1-20.

The results previously obtained are summarized. As before the colours are judged by three standard methods. Three of the five colours involved, bister, shamois and sulphury white have already been described, the remaining, apparently unknown two colours, yellowish white and stone colour, are described in detail. Various markings are also involved; a coloured and colourless margin to the hilum, the caruncle streak and a micropyle streak.

A line of "Braune Bohne" with bister testa colour, dark brown margin to the hilum, dark brown caruncle and caruncle streak and no micropyle streak was crossed with a line of "de la Chine" with sulphury white testa, pure white margin to the hilum, no caruncle streak and no micropyle streak. As regards testa colour the genotypical constitution of the parents is PP CC JJ GG bb vv and PP CC jj gg bb vv respectively and the F_1 (leaving out the basal factor for colour P and the two recessive factors common to both) will be CC Jj Gg and bister in colour, with a caruncle streak but no micropyle streak.

The F_2 data shew that stone colour is caused by G together with C and P and this combination also gives a dark brown margin to the hilum. Ca is the factor for caruncle streak which only shews in the presence of G. Micropyle streak is a recessive character and the two dominant factors Mi and Mia behave as inhibitors. The presence of J is necessary for the expression of the character. Yellowish white testa colour is caused by the two of the three genes ca, mi and mia in their recessive condition on the genotype PP CC jj gg.

No mottled seeds occurred in this cross which confirms the assumption that this character is due to the presence of C in a heterozygous condition.

129. LAMPRECHT, H. 635.652:575.11.061.6:581.48
 Zur Genetik von *Phaseolus vulgaris*. V. Spaltungsergebnisse nach Kreuzung einer weissamigen mit gefärbtsamigen Bohnenlinien. (On the genetics of *Phaseolus vulgaris* V. Segregation results after crossing a white with a coloured seeded line of beans.)
 Hereditas 1932: 17: 54-66.

The results of v. Tschermak and Shull who crossed plants with white and coloured seeds and obtained an F_1 with seeds of a different and deeper colour are described and discussed in the light of the results here given.

A basal factor P and 6 colour factors, C, J, G, B, V and R are involved in the colour of the testa. All these factors and their combinations except R have already been discussed in previous papers. R, together with the other factors, in various combinations causes a series of red or reddish colorations.

The first cross was between line 28 of the white seeded "Favorit" and line 27 of the pale ecru seeded "de Digoïn." The testa colour of the F_1 was snuff brown and F_2 segregated into snuff brown, pale ecru and white in a 9:3:4 ratio. The constitution of the white seeded parent is, therefore, pp cc JJ gg BB vv and that of the hybrid Pp cc JJ gg Bb vv.

The second cross was between line 28 of "de Digoïn" and line 30 of "Lyonais" with brown pink seeds. The F_1 had brown pink seeds like the line 30 parent. F_2 segregated into brown pink, snuff brown and white in the ratio 9:3:4. Line 30 has, therefore, the constitution PP cc JJ GG BB vv and F_1 is Pp cc JJ Gg BB vv.

130. LAMPRECHT, H. 635.652:575.116.1
 Zur Genetik von *Phaseolus vulgaris*. IV. Studien über Genenkoppelung, mit einem Fall von erblich bedingtem wechselnden Crossoverprozent. (**On the genetics of *Phaseolus vulgaris* IV. Studies on gene linkage, with a case of variable cross-over percentage, genetically conditioned.**)
 Hereditas 1932: 17: 21-53.

The linkages already found by Tjebbes are noted. The linkage between G-Vi (C-G Tjebbes) was not confirmed by the author.

The factors involved in the present study were Vi-vi for green and yellow pod colour, Fa the basal factor for a singly curved ripe pod, Da the basal factor for a straight pod, Ea-ea one of the factors for elliptical and round pod section Ia one of the factors for the two types of French beans, Brech and Schwert and P, J and C the factors which together give a shamois testa colour with a bister margin to the hilum. For the calculation of the crossing-over percentage the "product ratio" method was used.

In the first cross, linkage was found between the character pairs (so-called because they may consist of more than one factor pair) Fa-Da, Fa-Ea and Da-Ea, with cross-over percentages of 17.08, 10.37 and 14.73 respectively. No linkage was found between Vi, Fa, C and J.

One of the parents of the above cross was used for the following cross and in F_1 the same characters were dominant as before. The crossing-over percentages of the character pairs Fa-Da, Fa-Ea and Da-Ea in this case were 26.78, 14.75 and 17.78 respectively. The possible causes for this difference are discussed.

Under the conditions of the experiment external effects are improbable and the presence of one or several genes modifying the cross-over percentage is suggested, as has been found in *Drosophila*. Experiments to test this are in progress.

It was observed that in crosses where the two types Brech and Schwert are concerned there was always a considerable deficiency of the double recessives of yellow Schwert type but not of the double dominants, green Brech type and linkage is therefore ruled out. Further research must decide whether it is due to elimination of male or female gametes or of zygotes.

131. NILSSON, E. 635.656:575.11
 Erblichkeitsversuche mit *Pisum*, III-V. (**Inheritance experiments with *Pisum*, III-V.**)
 III. Ein reproduktionsletaler Biotypus und seine Spaltungsverhältnisse. (**A reproduction-lethal biotype and its segregation ratios.**)
 IV. Ein Fall von monohybrider Petaloidie. (**A case of monohybrid petaloidy.**)
 V. Eine monohybride Spaltung mit drei Phänotypen. (**A monohybrid segregation with three phenotypes.**)
 Hereditas 1932: 17: 71-99.

Plants were found among the progeny of a cross between "Dippes Mai" and "Dicksons früheste und beste" with flowers that did not open and with misformed reproductive organs. Reciprocal crosses shewed that some of the pollen was functional but that there was complete female sterility. The segregation ratios, while approximately monohybrid always shewed a considerable deficiency of sterile plants.

No indication of an elimination of the recessive gametes was observed and an elimination of the homozygotes is therefore suggested due to the sub-lethal effect of the combination of the two recessive genes. The facts are not in accordance with a linkage between two factors for fertility. Plants with flowers shewing petaloidy were found in a line of "Witham wonder" which differed in some other respects from the normal. These were crossed with the normal strain and with a line of "Lincoln." F_1 was normal. The segregation ratios were approximately monofactorial but there were too few plants shewing petaloidy. It is suggested that some other genes, probably rr for wrinkled seeds, have an effect on the Pe-pe genes for normal-petaloid flowers as well as external conditions.

The rr plants are found to be less hardy than the RR and Rr plants.

The few cases of incomplete dominance in *Pisum* are noted and a cross is described between a variety with tendrils and a variety without. The tendrils of the parent were of the usual wire-like kind but in F_1 the plants possessed more or less strap-shaped tendrils. The F_2 segregated in the ratio 1:2:1 and the strap-shaped tendrils only occurred in the heterozygous form.

BOOK REVIEWS.

BAUR, E.

Konsequenzen der Vererbungslehre für die Pflanzenzüchtung.

575

consequences of genetics for plant breeding.)

(The

Handb. Vererbungswissensch. 1932: 3: 1-43.

This article deals briefly with the application of genetics to the practice of plant breeding. The various methods of selection are described and the theory underlying their use is indicated. Crossing, both of varieties and species, is similarly treated. The value of mutation and polyploidy is discussed as well as the occurrence of periclinal chimaeras, the gradual effects of conditions of cultivation and the creation of new forms. The part played by genetics in breeding for immunity is indicated.

The organization of the breeding work in the different countries is noted and a plea is made for some form of protection for the plant breeder, such as the introduction of plant patents.

DARLINGTON, C. D.

576.312

Recent advances in cytology.

J. and A. Churchill, London, 1932: pp. xviii + 559 illus., price 18s.

Karyology, the new science of the nucleus, with which this volume is concerned, has advanced with such rapidity that all but the specialists have been virtually left behind for some time past, all the more so as no comprehensive treatise on the subject has appeared for some time.

The latter difficulty now no longer exists. The first part of the work under review is designed "for the student who is a beginner," the second part for the research worker and the third part is a presentation of the author's own hypothesis and views concerning the theoretical aspect of the subject, an aspect which has only recently, and largely in the hands of the author and a few others, been developed.

The subject is a difficult one, and those not versed in it will not find the volume easily assimilable. The author's particular style of writing sometimes serves to accentuate rather than elucidate these difficulties. It is, however, of such vital importance in relation to heredity that no serious student of genetics or breeding can afford to neglect it. The ordinary facts of nuclear division are described in the light of modern knowledge. Examples of interest to the geneticist are too numerous to quote: among them are the principle of the constancy of the unit-particles making up the chromosome, the chromomeres or genes; the connection between racial, and often specific, differences and differences in chromosome morphology, number, etc.; the random pairing of chromatids in auto-polyploids; the chromomere rather than the chromosome as the unit of pairing.

The chromosome behaviour in hybrids differing and not differing in chromosome structure is analysed in some detail. It is shewn that the influence on pairing of dissimilarities in the chromosomes is influenced by the degree of chiasma formation in the chromosomes concerned and this in turn by the length of the chromosomes. Thus, it is pointed out that chromosome pairing is not always a reliable criterion of relationship.

The question of polyploids of various types is treated in considerable detail, a whole chapter being devoted to their behaviour, from which much insight is gained into the nature of chromosome pairing and the factors upon which it depends. From this point of view studies of the various cases of autosyndesis are particularly instructive and when applied to polyploid species give indications of their degree of differentiation.

The evolution of polyploids receives a chapter to itself, in which arguments are adduced to shew the importance and nature of the role of polyploidy in the origin of the species. Considerable significance is attached to the difference between meiotic pairing (chiasma formation) and somatic pairing, as shewn by many secondary polyploids with secondary pairing.

To "the chromosomes in heredity" two chapters are devoted, in which the quantitative relations of the chromosomes are discussed, the evidence for the cytological basis of crossing-over

reviewed and a body of evidence adduced in support of the chiasmatype theory of crossing-over between 2 of the 4 chromatids before the formation of chiasmata. This leads to a presentation of the author's view of meiosis, in which its close correspondence with mitosis is argued, the one essential difference being shewn to be the relatively later division of the chromosomes into chromatids. Various abnormalities of meiosis and ways in which this may be conditioned are described; many of these can be explained on the view of meiosis previously presented; experimental geneticists and many plant breeders will find this section particularly instructive, and leading from this the cognate section on apomixis, in which the ways and conditions under which meiosis or fertilization or both may be omitted from the reproductive cycle are discussed in some detail.

The last chapter is devoted to views and suggestions, certain of them highly speculative and original, on fundamental questions such as the origin and essential nature of the gene, the phenomena of nuclear behaviour, the sexual cycle, apomixis, segregation in parthenogenetic species, polyploidy and secondary polyploidy, the species and evolution. Selection on the products of variation, resulting from discontinuous gene, structural or numerical change, is regarded as the mechanism of evolution.

The volume gains enormously in value in being furnished with a glossary of current cytological terms and a bibliography of selected works and works referred to in the text.

Various typographical and similar errors occur.

DARLINGTON, C. D.

576.312:575:633

Chromosomes and plant-breeding.

Macmillan and Co., Ltd., London, 1932: pp. v + 112 illus., price 7s. 6d.

The science of genetics, and especially the cytological aspect of this science, has grown with such alarming rapidity that plant breeders have for some time had difficulty in keeping abreast of the times, all the more so as there has been no satisfactory textbook or reference book in which the new knowledge is presented. Dr. Darlington has done a service to plant breeders in presenting the cytological aspect in a form peculiarly attractive to the breeder, brief, clear and thoroughly "understandable," and limiting the reference almost entirely to horticultural or agricultural plants.

There can be no doubt that really big advances in plant breeding will result from the application of the cytological knowledge of the crop plants and no plant breeder can afford to ignore this knowledge. As Sir Daniel Hall points out in the introduction, and the author in the conclusion, a knowledge of the chromosomes of the parents may save the breeder many years of fruitless endeavour and enable him to set out on the most profitable lines at the very outset.

The substance of the volume is based on the articles referred to in "Plant Breeding Abstracts" Vol. I, Abst. No. 324, but the subject matter has been somewhat enlarged and the scope extended.

BECKER, J.

634/5:575

Grundlagen und Technik der gärtnerischen Pflanzenzüchtung. (Fundamentals and technique of horticultural plant breeding.)

Paul Parey, Berlin 1922: 400 pp. illus. Price 12.60 Rm: (Recd. May, 1932).

Although published as long ago as 1922 this manual contains much information necessary for the practical breeder to carry on his work on scientific lines, together with an outline of the science of genetics as represented by Mendelism as such.

General topics are treated first—fundamental problems of propagation, including remarks on a number of different ways of vegetative propagation and descriptions of the flower of various horticultural plants, questions of systematics such as the species concept, pure lines, variation and the action of natural and artificial selection and finally mutation.

The third chapter is devoted to heredity, the mechanism and a number of other questions are discussed fully and clearly, from a more or less historical point of view and largely illustrated by Mendel's own results.

Considerable space is given to practical details of the care of the experimental material and of the breeding plots, points of technique, keeping of records and the like.

Methods of breeding for various special objects are touched upon and various methods of selection are discussed at length.

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